AUGUST
1960

FOUNDRY

A PENTON PUBLICATION

Casting Centrifugally in Ceramic Molds
Page 53

- Aluminum Castings for the Corvair Engine — Page 57
- Casting of Tire Molds in Ductile Iron — Page 60
- Properties of Three Copper-Base Alloys — Page 66
- Sand Moisture's Effect on Casting Quality — Page 70

CONTINUED — Page 24

FIVE-DEEP

Traveling four times as far as the moon

to help you profit with UCM's "FIVE-DEEP" Ferroalloys

1 Customer Service, ready as your phone, brings Union Carbide Metals' field engineers to your melting plant—from any of 9 sales and service offices. In providing on-the-scene assistance, they gladly make available UCM's integrated experience in the application of ferroalloys to various melting practices.

Lately, their travels to mills and foundries have soared to well beyond the million-mile mark—each year! This customer service is just one of the 5 intangible but ever-present extra values of UCM's FIVE-DEEP alloys which mean better products and bigger profits for you. The others:

2 Technology—many million dollars worth a year—helps you produce better, more profitable metals. UCM's 600-man research and development center is the birthplace of hundreds of new alloys.

3 Unmatched Facilities free you from delivery worries. Only UCM gives you 6 plants—3 with their own power facilities—and 17 warehouses, all located for fast shipments by rail, truck, or water.

4 Global Ore Sources assure you uninterrupted supplies of ferroalloys. UCM's close association with world-wide mines provides dependable raw material sources.

5 Strictest Quality Control—with over 100,000 tests per month from mines to shipment—makes sure you always get alloys of uniform size and analysis, with minimum fines, lot after lot.

For better metals, production economies, bigger profits, insist on UCM's FIVE-DEEP alloys. Union Carbide Metals Company, Division of Union Carbide Corporation, 270 Park Avenue, New York 17, N. Y., producer of "Electromet" brand metallurgical products.

"Union Carbide" and "Electromet" are registered trade marks of Union Carbide Corporation.

UNION CARBIDE METALS

Only **ELECTROMET** ferroalloys from **UCM** are so deep in extra values to help you.

Circle 551 on Page 45

Most effective way to produce ductile iron...

Use Inco's Nickel-Magnesium Additives—NMA #1 or NMSA #2

The most effective way to produce ductile iron* castings is to introduce the magnesium into your melts with a nickel carrier.

And it's easy when you use Inco's two high-density, quick-melting nickel-magnesium additives, developed specially for use in the production of ductile iron.

Advantages of using Inco's Additives in your melts

- two uniform sizes for easy addition – either 2¼ x ¾" or 1" x 8 mesh.
- higher magnesium retention than any non-nickel additives in both conventional and plunging methods of treatment.
- higher density reduces floating and burning at surface in conventional treatment; requires smaller volume in bell in plunging treatment.
- higher pouring temperatures – sustains less temperature loss on treatment.
- increased tensile and yield strengths, improved wear-resistance in nickel-alloyed ductile iron.
- improved Ni-Resist** austenitic ductile iron castings.
- uniform and reproducible characteristics for each melt.
- greater control over casting production—reduction of costly rejects.

The table below shows the recommended Inco Additive to use in all commercially accepted types of ductile iron. For answers to your further questions on Inco's Nickel-Magnesium Additives, just contact your nearby Inco Field Section Office or your Inco Foundry Products Distributor.

*Ductile iron is produced by authorized foundries licensed under patents of The International Nickel Company, Inc.
**Registered trademark

THE INTERNATIONAL NICKEL COMPANY, INC.
67 Wall Street New York 5, N. Y.

NOMINAL COMPOSITION OF INCO ADDITIVES

Metal	NMA #1	NMSA #2
Magnesium	13-16%	13-16%
Silicon	——	26-33%
Nickel	Balance	Balance

INCO ADDITIVE TO USE FOR VARIOUS DUCTILE IRONS

Iron type	Recommended additive
60-45-10	NMSA #2
80-60-03	NMA #1 or NMSA #2
100-70-03	NMA #1
120-90-02	NMA #1
Ni-Resist austenitic	NMA #1 or NMSA #2

INCO NICKEL

NICKEL MAKES CASTINGS PERFORM BETTER LONGER

Howard Heath's broad experience is welcomed by Alcoa's customers at all levels of production. In this picture, Elmer Sachse, Alcoa salesman, on the left, and Mr. Heath, on the right, are examining a boat davit produced by the Linmold Company of Compton, Calif. Mr. Lester Marcuse, general sales manager of Linmold, is in the center.

Howard Heath speaks "Foundry"

Foundrymen have a language all their own. Even some engineers and metallurgists never master it. But Alcoa's Howard Heath speaks it fluently, and this makes Howard unusually valuable to Alcoa's customers. When foundrymen tell him about a problem, he can get to the core of it quickly because there's no language barrier; then he can put his answers in suggestions that foundrymen understand.

That's why Alcoa uses Howard Heath as a field service metallurgist. West Coast foundrymen will tell you that in his case that title stands for unique service and a remarkable amount of savvy.

During the hectic years of World War II, Howard was superintendent of all the foundries—sand, permanent mold and magnesium—in Alcoa's booming Vernon Works. But, in spite of the magnitude of that job, we were always calling him out to solve problems in the foundries of Alcoa's pig and ingot customers who were also engaged in essential work. No one else, it seemed, could analyze the trouble and come up with the answer as quickly as Howard.

After the war, when the pace slackened a bit, we found we had other men who could run the foundries, but no one who could quite fill Howard's shoes with our customers. So we put him to work full time helping them.

Help like this is unique in the aluminum industry, and it's why you get more than 16 ounces of metal in every pound of Alcoa® Aluminum you buy. Nine thousand times a year, calls for help get prompt attention from Howard and 36 other Alcoa service representatives with various titles and specialties. In Howard's case, the solution may be as simple as relocating a riser in a sand casting pattern. Or as complex as checking 700 critical points on the mid-frame casting for a jet fighter. But no problem stumps a man with a background of experience like Howard Heath's.

Over the years, Alcoa has pioneered many of the major advances in light-metal foundry practice. It's because Alcoa is willing to share this experience with its customers that you get more than 16 ounces of aluminum when you buy a pound of pig or ingot from Alcoa.

Send for Alcoa's New Pig and Ingot Brochure

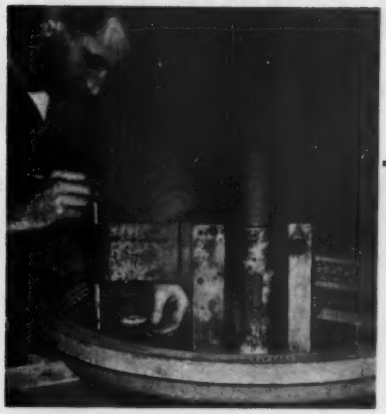
This new 12-page booklet lists all grades and alloys available in pig, ingot and billet form, together with their composition and properties. It also describes the services and technical assistance available from Alcoa's metallurgical staff, the most experienced and unbiased in the industry. Write today: Aluminum Company of America, 2115-H Alcoa Building, Pittsburgh 19, Pa.

World-wide sales through Alcoa International, Inc., 230 Park Avenue, New York 17, N.Y.

ALCOA ALUMINUM

FOR EVERY PIG AND INGOT REQUIREMENT

Circle 555 on Page 45



Close accuracy is required of tire mold castings. An inspector at the Cedarville, Ohio, plant of Morris Bean & Co. is shown here checking dimensions of a mold half cast in ductile iron at that foundry. A description of the production process starts on Page 62.

August 1960
Volume 88—Number 8

FOUNDRY
A PENTON PUBLICATION

Formula for Success 51
Editorial—By WILLIAM G. GUDE

Casting Centrifugally in Ceramic Molds . . . 52
At American Cast Iron Pipe Co., ceramic molds for centrifugal casting are formed centrifugally in much the same way that tubular castings are formed. This technique offers several advantages—By JACK C. MISKE

Aluminum Castings for the Corvair Engine . . . 57
Low-pressure permanent molding of Corvair engine castings provides casting yields up to 96 per cent. Melting costs also are minimized by the purchase of molten aluminum—By ROBERT H. HERRMANN

Making Ductile Iron Tire Molds 60
Plaster, elastic vinyl polymer gel, resin-bonded sand, and green sand play an important part in the production of four different types of ductile iron molds used to make tires—By ROBERT H. HERRMANN

Properties of Three Copper-Base Alloys 66
New uses for standard cast copper-base alloys are expected as data on their mechanical and physical properties are published. Here is a report on 80-10-10, 85-5-5-5, and Navy "M" alloys—By J. G. KURA

Effect of Sand Moisture on Casting Quality . . 70
Variable factors in molding sand produce important changes in casting quality. This article reports on a study of moisture content and its effects on molding sand properties—By JOSEPH S. SCHUMACHER

Risering Steel Castings (Part I) 75
Correct risering of steel castings involves two basic problems—riser location and dimensions. This article, No. 11 in our gating and risering series, is the first of three on risering of steel—By H. F. BISHOP

International Foundry Group Meets in Zurich . 98
1960 meeting of the International Foundry Congress will be held in Zurich, Switzerland, Sept. 19-24. Program includes technical sessions and tours

Modern Features Characterize New Foundry . 102
New Sulzer Brothers foundry at Oberwinterthur, Switzerland, covers 350,000 sq ft and is designed for efficient production of gray iron and steel castings ranging from 200 lb to 120 tons—By A. KUGLER and F. EISERMANN

Betatron Installed in Swiss Foundry 116
Steel castings up to 20 in. thick can be radiographed by betatron installation at George Fischer Ltd., Schaffhausen, Switzerland—By J. GRINDROD

Furfuryl Alcohol Is Base for New Binder 128
New type of sand binder is based on furfuryl alcohol. General properties of this binder and how it is used are described in this article

CONTINUED NEXT PAGE

Publisher and Editorial Director: FRANK G. STEINEBACH

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CONTINUED FROM PAGE 3

Conveyor System Speeds Casting Handling . . 132

Circuitous free track connects all stations in process operations. It divides into four parallel cooling and storage lines. Three powered conveyors move castings along the free track

Man to Man 139

All about a visit to Traverse City Iron Works, a progressive, 89-year-old foundry where quality is better than it has to be—By RALPH L. LEE

Castings Data Presented at ASTM Meeting . . 150

By EDWIN BREMER

The Sandman Says 152

This month, the Sandman discusses the results of tests to determine the effects of shell cores on a green sand system—By HAROLD E. HENDERSON

Ceramic Shell Process at Arwood Corp. . . . 158

Recently developed ceramic shell investment process is expected to bring growth to Arwood Corp. and the entire industry—By ROBERT H. HERRMANN

Preparing an Economic Study on Furnaces . . . 170

A decision about the purchase of a heat processing furnace requires that capital investment and operating expense be known—By BERNT A. RUEDIGER

Solidification of Metal in Iron Molds 184

Curve relates depth of solidification in white iron to measured temperature at specified depth in the chiller mold—By J. D. KELLER and N. R. ARANT

In Every Issue

Around the Country	142	Men of Industry	186
Calendar of Meetings	16	News Views	176
Equipment and Supplies	85	Obituary	194
Foundry Developments	126	Patents of Interest	178
How To Do It	124	Questions and Answers	80
Industry Briefs	122	Statistics	33
Late News	33	The Shakeout	197
Literature for Foundrymen	165	With the Editors	10

Classified Advertising—203 Advertisers' Index—210 Business Staff—211

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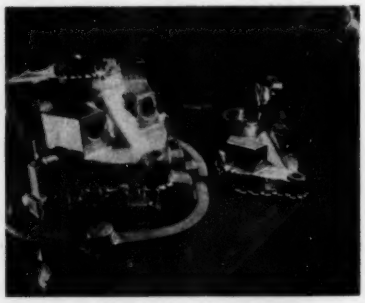
THE EDITORS' WORKSHOP

INTERNATIONAL: Foundrymen who journey to Zurich, Switzerland, in September for the 27th International Foundry Congress will find a rare combination of attractions. An excellent technical program of 24

papers (see Page 98) has been arranged; there will be visits to some of the world's most modern foundries; and then there is the natural beauty of Switzerland. M. M. Hallett, our European editor, will report on the meeting in a later issue.

TURBINE CASTING: What it takes to provide adequate gating for a gas turbine engine part is indicated by this view of the as-cast and



finished aluminum casting. The part is a reduction unit output housing produced by Boeing Industrial Products Div. at Seattle for its newest 400-hp turboprop small gas turbine engine. "Eyes" of the castings are the engine's accessory pads.

BUYER'S VIEWPOINT: Things to consider in buying castings are discussed in an article by Westinghouse Electric's Louis Iannettoni to be presented next month. It will include suggestions on how the foundry can help the buyer obtain the most for his money.

YOU can profit from using Allis-Chalmers lift trucks just as these foundries have

Handling of materials offers some of the best opportunities open to foundries for cutting costs . . . since up to 150 tons must be moved to produce one ton of castings. Foundries everywhere have learned that an Allis-Chalmers lift truck is a *proved* way to cut costs on many handling operations.

See your Allis-Chalmers dealer soon. Have him give you the facts on lift trucks with capacities ranging from 2,000 to 10,000 lb — better still, ask him for a demonstration in your foundry.

MIDWEST — Material is handled more efficiently . . . less time is required with this Allis-Chalmers 6,000-lb lift truck. With rotating device, it handles foundry sand, other bulk materials.

WEST — Bundles of scrap are handled in the yard, moved to charging area with this 6,000-lb lift truck. The operator "spots" loads quickly because the truck maneuvers so easily in tight quarters.

EASTERN — On indoor or outdoor handling, this 4,000-lb lift truck works fast, drives easily, turns in 72-in. radius to move castings easily.

GREAT LAKES — Inventory was simplified — storage space better utilized because of tons-at-a-time tiering with this 6,000-lb lift truck. It also makes possible real savings on other handling.

NORTH — Over 6,000 hours of trouble-free operation with these Allis-Chalmers 4,000-lb lift trucks caused this foundry to add several more of the same trucks to their fleet.

CENTRAL — Handling time was reduced 30% on materials moved by this and another Allis-Chalmers lift truck. They saved 90% of the time formerly required to unload refractory brick.

ALLIS-CHALMERS, Milwaukee 1, Wisconsin

ALLIS-CHALMERS

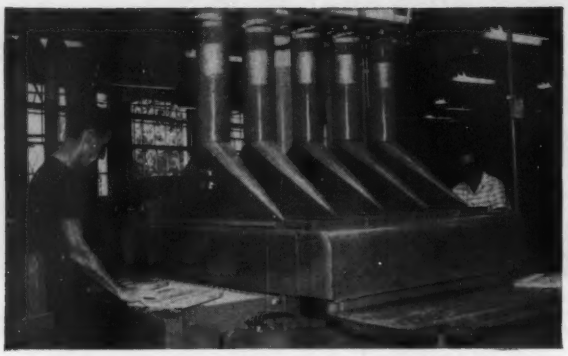
BH-61A

Circle 556 on Page 45

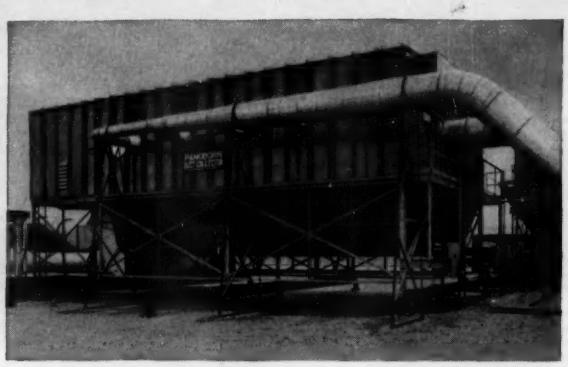
Operation: Dust Control

(One of a series)

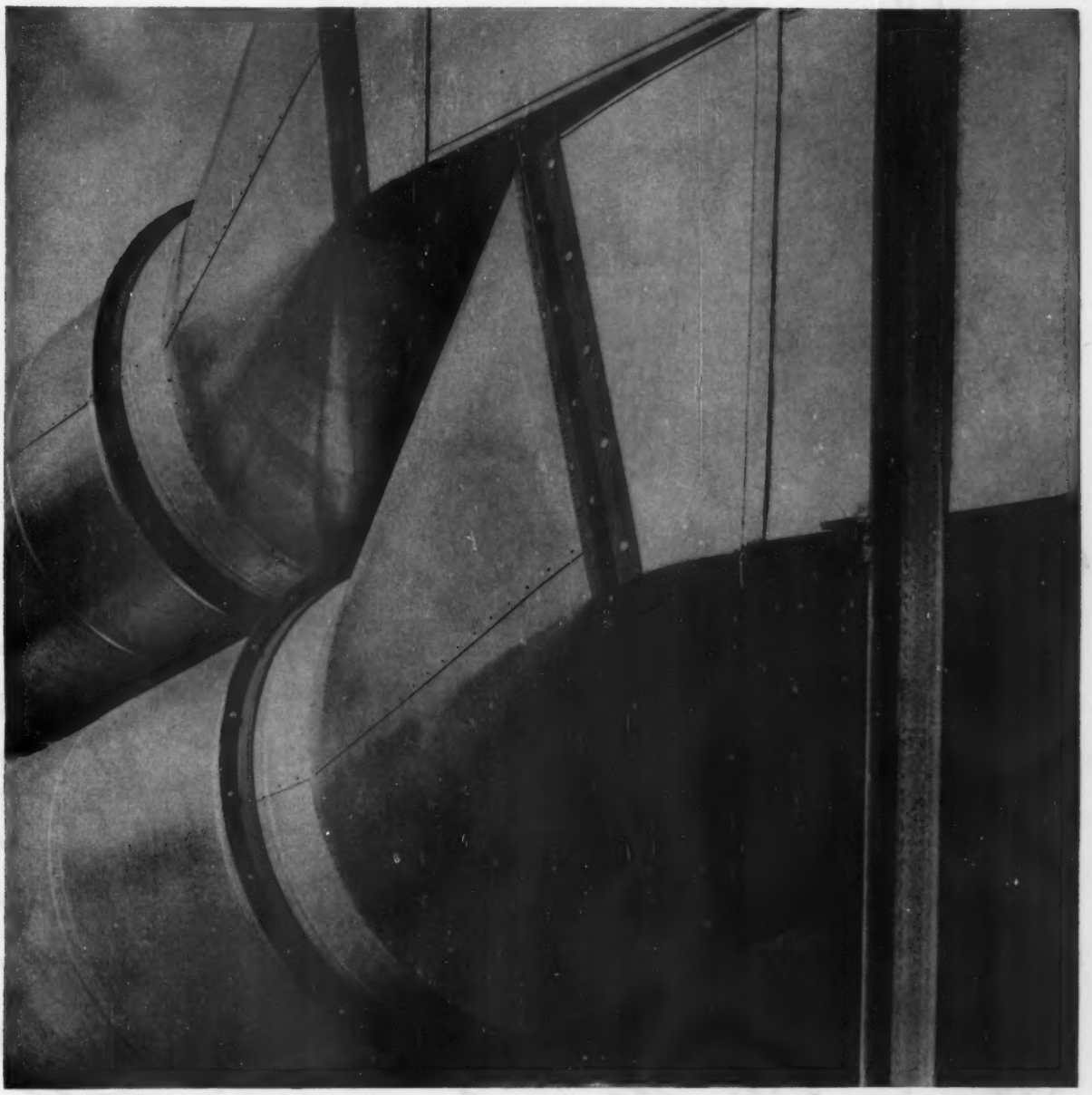
At National Cash Register, 10 tons of wood



Dust is trapped at the source by hoods engineered for the individual job . . .



. . . and is piped from 160 locations to five giant Pangborn Cloth Bag Collectors.



shavings, chips and dust are collected daily!

Mammoth is the word for the 5-floor woodworking plant of National Cash Register headquarters, Dayton, Ohio. Processing nearly 300,000 sq. ft. of lumber each month, this operation generates 10 tons of waste material per day.

To protect NCR employees, equipment, plant and neighborhood, five Pangborn Cloth Bag Dust Collectors trap 90 cu. ft. of fine dust for disposal and, during the winter months, permit recirculating of the already-heated, cleaned air. This efficient performance of Pangborn Dust Control saves thousands of dollars in heating costs during the cold weather. In addition, a neighborhood and health nuisance has been eliminated; equipment maintenance and plant housekeeping costs have been minimized.

Dust a continuing problem in *your* plant? Talk to the Pangborn man in your area or write: PANGBORN CORPORATION, 1400 Pangborn Blvd., Hagerstown, Md. *Manufacturers of Dust Control, Blast Cleaning, Vibratory Equipment—Rotoblast® Steel Shot and Grit.®*

Pangborn
OF HAGERSTOWN

Circle 557 on Page 45

COST CHECK
5-4-5

3M'S "COST CHECK 5-4-5" PROGRAM CAN HELP YOU DISCOVER:

- ✔ IF YOUR GRINDING CAN BE DONE MORE ECONOMICALLY
- ✔ IF YOUR FINISHING IS AS EFFICIENT AS POSSIBLE
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a cost analysis program for grinding, finishing, polishing

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* 3M's trained representative who can call upon this vast array of experience and talent to answer your questions and give you on-the-spot recommendations.

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Circle 558 on Page 45

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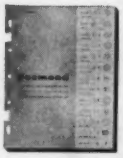

NAME

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COMPANY

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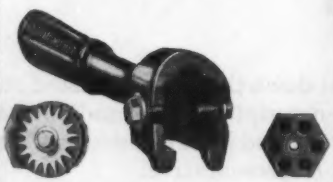
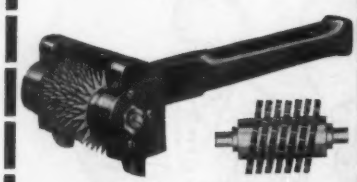


Desmond Hex Dresser

LIVES FOR FOUNDRY GRINDING WHEEL



Desmond Heavy Duty Dresser

DRESSERS

Cut grinding and snagging costs with inexpensive Desmond Hex dressers. They bring grinding wheel faces to "new" efficiency by removing loaded metal and exposing sharp abrasive grains. And Hex dressers provide six sets of bearings in one set of bearing blocks . . . for extra life on average wheels. For resinoid and rubber bonded high-speed wheels use the ball-bearing Desmond Heavy Duty Dresser. Ask your Desmond distributor's advice.

Desmond

Desmond-Stephan Mfg. Co.
Urbana, Ohio

Circle 559 on Page 45

With the Editors

WHAT THEY READ: Before concluding the comments on various features of the 1960 AFS Convention and Foundry Show at Philadelphia, I would like to mention the FOUNDRY booth and report on one activity there.

We had an entirely new booth, which was quite modernistic in concept and attractive in appearance. It replaced a display which had served FOUNDRY and its sister publications well over the past decade. A view of the new display is shown in the illustration below.

As at several recent exhibitions, FOUNDRY made available a variety of reprints of editorial articles. These were mounted in pockets in the center section of the booth, where convention visitors could make their own selection. There was no charge for this service.

Rand Ebersole and Dave Gibbs of the FOUNDRY staff kept track of the number of reprints distributed, and the results were very interesting. For example, approximately 5000 reprints were carried away by our visitors. We were surprised to find that the most popular reprint was not a recent technical article, but a general report, presented in the May, 1957 issue, entitled "Foundries Can Sell More Castings." Five hundred foundrymen took that reprint. "Operation Marketing" from the April, 1959 issue also proved of considerable interest.

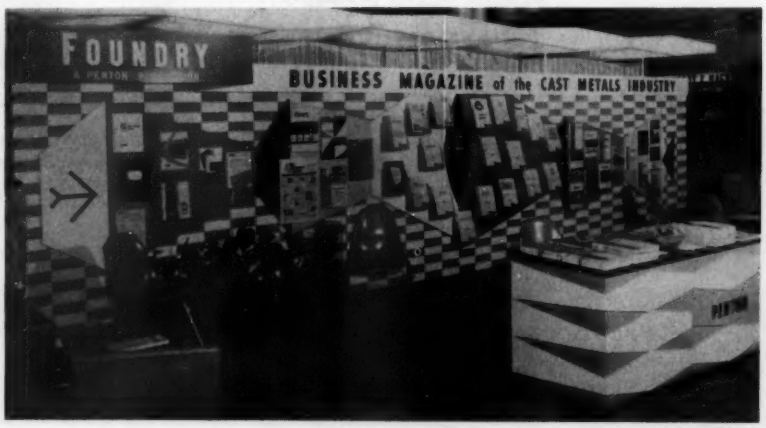
Some of the other popular reprints, where the distribution was between 200 and 400, were as follows: "Shell Molding—10 years of Progress"; "Molding Sand Symposium"; "Conveyor Belting"; "Solidification and Heat Treatment"; "Estimating Casting Weights"; "Practical Tips on Cupola Control"; "Investment Shell Process"; "Pouring Castings in Ungassed Sodium Silicate Bonded Molds"; and "How a Jobbing Foundry Can be Mechanized."

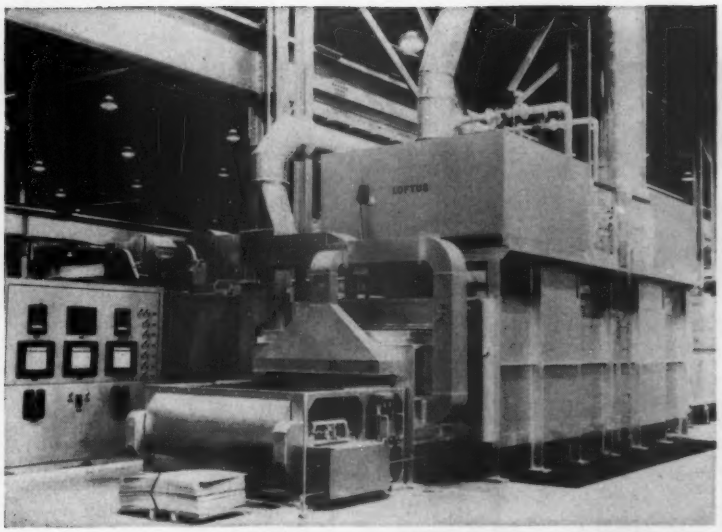
We want to thank all of the people who called at our booth, who took away some of the FOUNDRY reprints, who helped with our survey of the business outlook in the foundry industry (Editor Bill Gude's editorial, page 99, June 1960) or who just stopped to visit.

Florida Foundry: Jack Pease, formerly vice president of the Penton company and well known to a number of oldtime FOUNDRY advertisers, has sent a copy of an article, "Foundry Founder," which appeared in an issue of the *Orlando Sentinal*, Orlando, Fla.

The article tells how C. C. Pope, a foundryman for many years, started his own foundry in Alabama in 1941. One son, Clinton, was with his father at the start, and another son, Clark, joined the organization a short time later. The company turned out castings for Victory cargo boats, the biggest project being ventilator turning gears for oil tankers.

In May, 1944, the plant was completely destroyed by fire. Another building was secured and production





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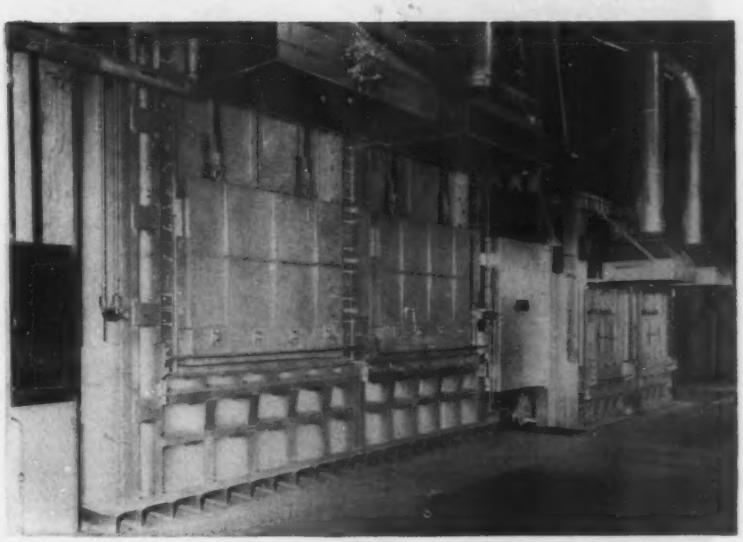

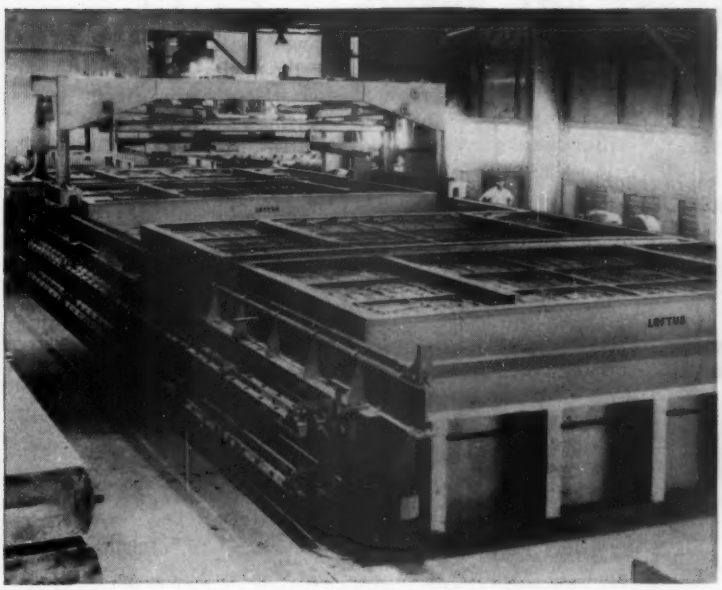

Loftus custom-builds complete plants and specializes in furnaces of all types and sizes for both ferrous and non-ferrous metals. Whatever your requirements, it will pay you to call on the engineering and construction know-how developed by Loftus over more than two decades of service to American metal producers.

From first heat to heat treat, look to

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Circle 560 on Page 45

60.15.3

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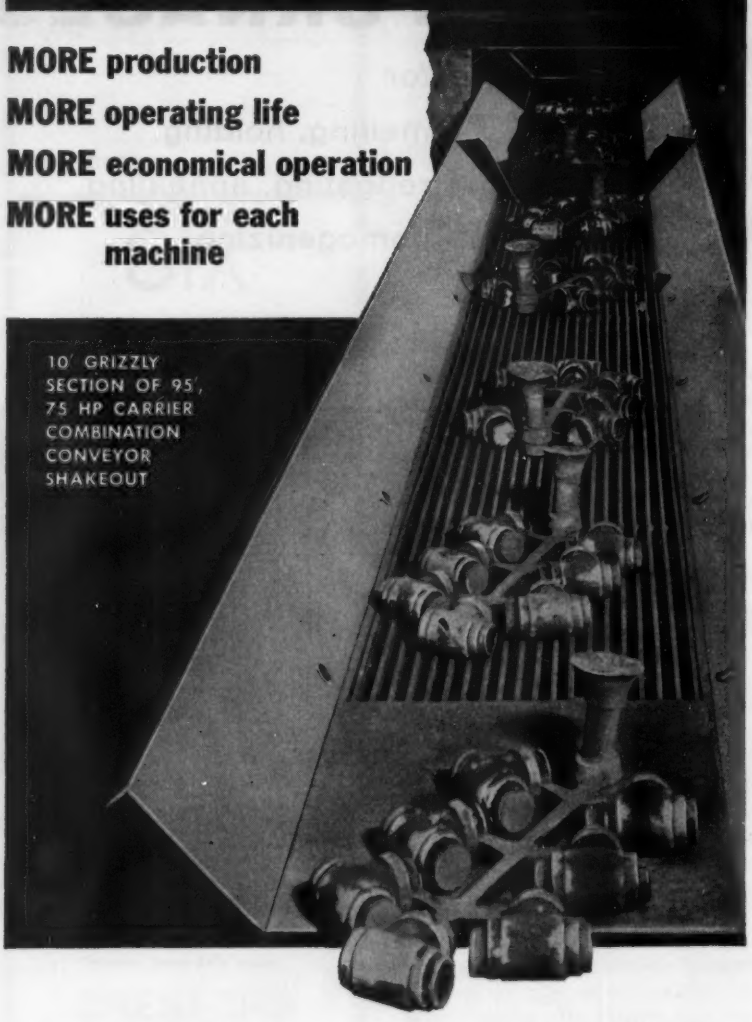

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DISTRIBUTE • ELEVATE

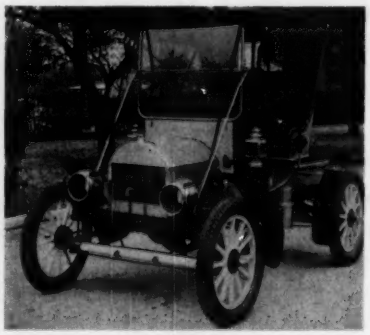
continued. At the end of the war, the shop was converted to domestic work in a single day's time.

The Popes sold that company and built the Florida Pipe & Foundry Co., which began operation in Haines City, Ala., on Oct. 1, 1950. The company now employs 180 in the manufacture of castings for plumbing supply jobbers. C. C. Pope is president, Clinton Pope vice president, Clark Pope secretary-treasurer, James A. Paris mechanical superintendent, and T. V. Stewart foundry superintendent.

The company is remodeling its original foundry building and installing a new unit for mechanically producing shell cores.

Early Compact: Harry W. Dietert, chairman, Harry W. Dietert Co., transported a 1911 Brush runabout from his home in Kenville, Tex., for display at the company's booth at the Philadelphia show.

Harry is a collector of antique automobiles, but this particular car seems to be his pet. He has rebuilt



much of it, and displays the original and more recent workmanship with a great deal of pride. Readers of this column will recall that Harry and Alma Dietert included a photograph of themselves in the car in the 1958 Christmas card, and that it was reproduced on page 12 of the February 1959 issue.

A few statistics may be of interest. The 10-hp motor has a gray iron cylinder block and fly wheel and a cast aluminum base. The chassis is made of oak timber and the body is suspended by four coil springs in tension. The transmission case and the differential housing are gray iron castings. Speed is from 1 to 25 mph, and the cost of operation is 1 cent a mile.

F.G.S.

Circle 561 on Page 45

X marks the trouble spot in seconds!

Xeroradiography cuts x-ray inspection time and cost! With this revolutionary method, radiographs are obtained electrostatically — images *dry* and ready to read less than a minute after exposure. A characteristic phenomenon called "highlighting" *automatically emphasizes discontinuities*—will show up defects indiscernible by other means. Here at last you find both *radiographic detail* and *high exposure speed* rolled into one!

Xero (zero) radiography is beyond doubt the long-awaited answer for many industries seeking fast, economical production-line x-ray inspection. Proved applications range from tire manufacturing to the production of extruded metal tubing, and it is particularly valuable in the *foundry* for inspecting light alloys. One prominent aircraft manufacturer* reports 25% cost savings with xeroradiography and is strongly urging its vendors to use it.

For complete details on xeroradiography, contact your local G-E x-ray representative now . . . or write to X-Ray Department, General Electric Company, Milwaukee 1, Wisconsin, for Pub. YY-84.

*Name available on request.

Progress Is Our Most Important Product

GENERAL ELECTRIC

. . . National COOLEVAYOR's Here

The penalty of hot sand is *scrap*. But, all too often the cost of sand cooling equipment, for the small or medium size foundry, would appear to exceed whatever scrap savings may be effected.

The National Coolevayor was specifically designed to answer the foundryman's need for a highly efficient, yet low-cost separate cooling device which can be easily incorporated into most systems.

As you can see from the diagram, Coolevayor occupies little floor space. It's fast and flexible. It loads at the bottom and discharges at the top so that you can elevate, as you aerate, as you *cool* the sand. The principle employed . . . that of pulling air through the sand to evaporate moisture . . . is simple, practical and foundry-proven. Relative cooling efficiencies have been documented and are indicated in the chart.

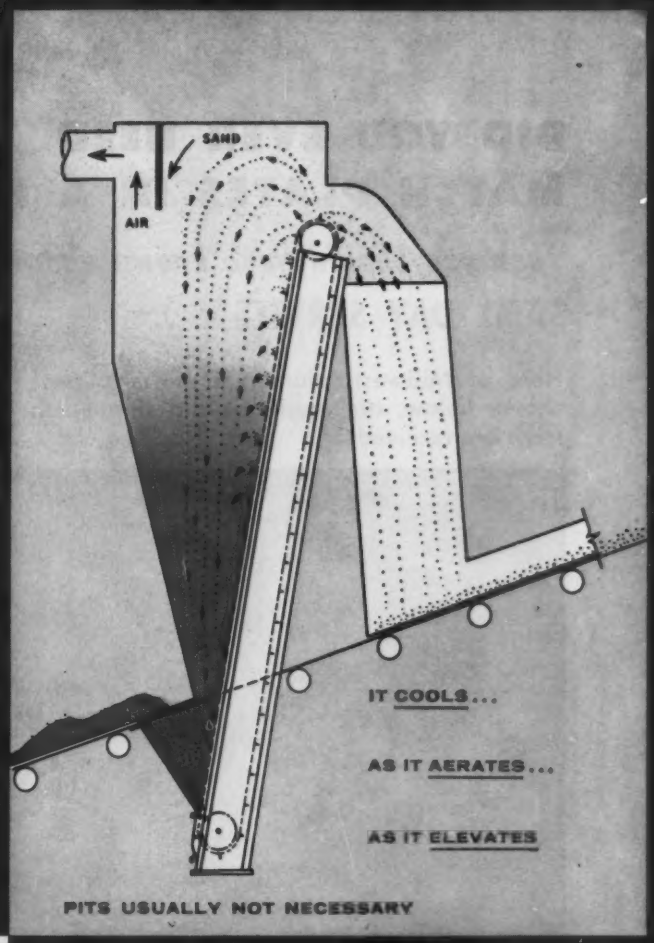
Why not *do something* about hot sand? Let a National engineer show you how Coolevayor can do double or triple duty in *your* shop . . . and pay its own way in reduced scrap, increased production and improved efficiency. Write for a Data Sheet on Coolevayor.

WRITE FOR COOLEVAYOR DATA SHEET

NATIONAL ENGINEERING COMPANY
646 Machinery Hall Bldg.
Chicago 6, Illinois

In Canada: 17 Queen St., East, Toronto 1, Ontario

MECHANI-MIZE
Foundry wize with
COOLEVAYOR



OPERATION

Within the large housing, a fast, flighted belt creates a virtual "sand storm"—while air is pulled through the sand to dissipate moisture and heat. Various degrees of cooling may be obtained by varying sand retention time and air volume exhausted. Floor space requirements are no more than 10 ft. by 4 ft. Unit may be charged by front and loader or shakeout belt.

CAPACITY

Coolevayor is available in three models ranging in capacity of from 30 to over 60 TPH. Shown at right are a team of two Coolevayors arranged to deliver tonnage in excess of 200 TPH. These units were displayed at the Foundry Show and are now operating at Albion Malleable Iron Company, Albion, Michigan.

NATIONAL COOLEVAYOR
RELATIVE COOLING EFFICIENCIES

Sand Temp. (°F) to Coolevayor	*Average Sand Temp. (°F) after Coolevayor	*Average Temp. (°F) Loss
200 to 215°	129.2°	77°
185 to 199°	120.4°	68°
170 to 184°	116.3°	60°
155 to 169°	112.8°	48°
140 to 154°	105.8°	44°

PERFORMANCE*

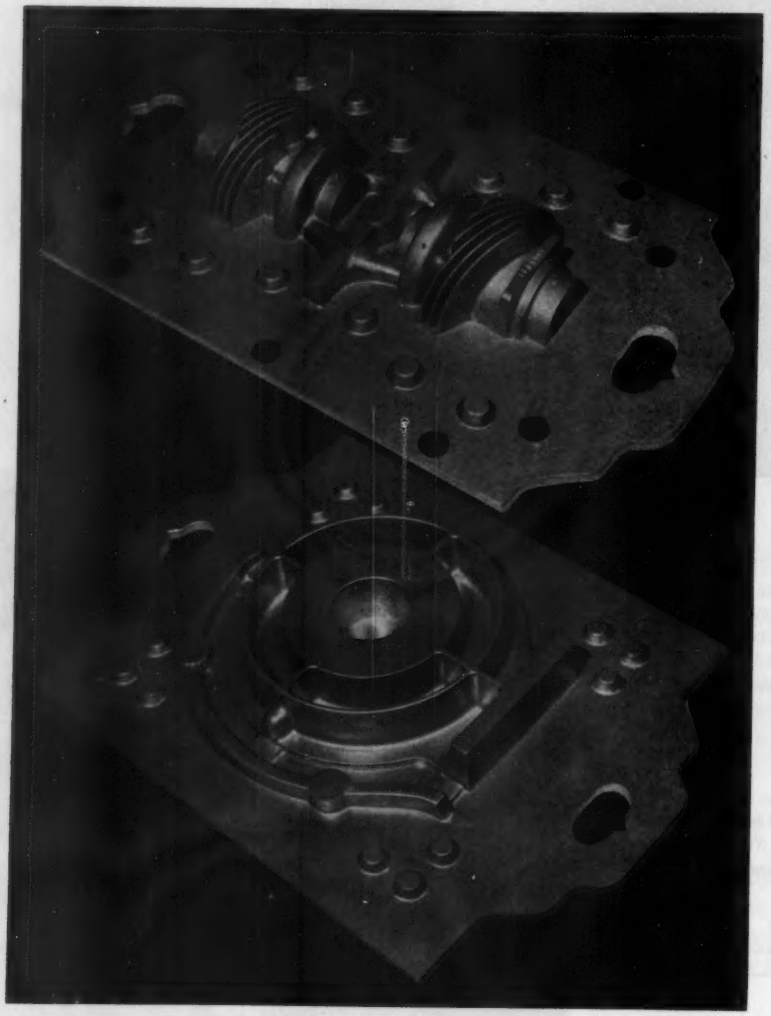
The above chart approximates the cooling efficiencies possible with Coolevayor. Obviously, factors such as room temperature, humidity and sand make-up contribute to lesser or greater efficiency in a given time. For this reason, Coolevayor, like many items of National equipment, is sold under a National Performance Guarantee, based upon your specific requirements.

Circle 563 on Page 45

DID YOU EVER NEED MATCH PLATES IN A HURRY?

Then you should have known about Midwest's SAME DAY SERVICE

Here at Midwest, aluminum match plates, similar to those shown below, are produced and shipped the same day patterns are received!



Advance notice is required, and the master pattern must be in our plant by 8 a.m. Flask sizes up to 15″ x 22″: $20. additional to regular charges. Larger sizes, slightly more. We produce aluminum match plates, cope and drag sets, core boxes, vacuum forming and foam molds, zinc and prototype castings. Our prices are competitive and our delivery schedule the best. Phone or wire:

MIDWEST PRESSURE CASTINGS CO.

1350 W. CERMAK RD., CHICAGO, ILLINOIS

CHesapeake 3-6033

CALENDAR of Meetings

Sept. 6-16—The Machine Tool Exposition—1960, International Amphitheatre, Chicago.

Sept. 6-16 — Production Engineering Show, Navy Pier, Chicago.

Sept. 14-15—American Die Casting Institute, annual meeting, Edgewater Beach Hotel, Chicago.

Sept. 18-20—Steel Founders' Society, fall meeting, Homestead, Hot Springs, Va.

Sept. 19-24—International Foundry Congress, Zurich, Switzerland.

Sept. 22-23—National Foundry Association, annual meeting, Edgewater Beach Hotel, Chicago.

Sept. 26-28—Standards Engineers Society, annual meeting, Hilton Hotel, Pittsburgh.

Sept. 26-29—American Welding Society, fall meeting, Hotel Penn-Sheraton, Pittsburgh.

Sept. 26-30—Instrument Society of America, fall Instrument-Automation Conference and Exhibit and annual meeting, Coliseum, New York.

Sept. 27-30—Association of Iron & Steel Engineers, Iron & Steel Convention and Exposition, Public Auditorium, Cleveland.

Oct. 12—Cast Bronze Bearing Institute, annual meeting, Grove Park Inn, Asheville, N. C.

Oct. 12-14—Gray Iron Founders' Society, annual meeting, Netherland Hilton Hotel, Cincinnati.

Oct. 13-15—Non-Ferrous Founders' Society, annual meeting, Grove Park Inn, Asheville, N. C.

Oct. 14-15—New England Regional Foundry Conference, Kresge Memorial Auditorium, Massachusetts Institute of Technology, Cambridge, Mass.

Oct. 17-18—American Coke and Coal Chemicals Institute, annual meeting, Greenbrier, White Sulphur Springs, W. Va.

Oct. 17-18—Magnesium Association, annual convention, Hotel Carter, Cleveland.

Oct. 17-21—American Society for Metals, National Metal Exposition & Congress, Trade and Convention Center, Philadelphia.

Oct. 17-21—National Safety Council, Annual Safety Congress, Chicago.

Oct. 19-21—Society for Experimental Stress Analysis, annual meeting, Hotel Claremont, Berkeley, Calif.

Oct. 20-22—Foundry Equipment Manufacturers Association, annual meeting, Greenbrier Hotel, White Sulphur Springs, W. Va.

Oct. 21-22—Northwest Regional Conference, Vancouver, B. C.

Oct. 22-25—Conveyor Equipment Manufacturers Association, annual meeting, Greenbrier, White Sulphur Spring, W. Va.

Oct. 27-28—Purdue Metals Casting Conference, Purdue University, Lafayette, Ind.

Oct. 27-28—All-Canadian Regional Foundry Conference, Mt. Royal Hotel, Montreal, Que.

Nov. 1-3—Material Handling Institute Inc., Central States Show, Kentucky Fair and Exposition Center, Louisville.

Nov. 2-3—Investment Casting Institute, annual meeting, North Park Hotel, Chicago.

Nov. 3-4—Michigan Regional Foundry Conference, Bancroft Hotel, Saginaw, Mich.

Nov. 8-11—Society of Die Casting Engineers, First National Die Casting Exposition & Congress, Detroit Artillery Armory, Detroit.

Nov. 14-16—Steel Founders' Society, Technical and Operating Conference, Pick Carter Hotel, Cleveland.

Nov. 30 - Dec. 2 — Metallurgical Society of AIME, Electric Steel Conference, Morrison Hotel, Chicago.

1961

Feb. 26-Mar. 2—American Institute of Mining, Metallurgical, and Petroleum Engineers, annual meeting, St. Louis.

March 11-14—Steel Founders' Society of America, annual meeting, Drake Hotel, Chicago.

March 20-24—American Society for Metals, Western Metal Show, Pan-Pacific Auditorium, Los Angeles.

April 18-20—Foundry Educational Foundation, annual college-industry conference, Hotel Statler, Cleveland.

May 8-12—American Foundrymen's Society, Castings Congress & Exposition, San Francisco.

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COMPARE SPEED

With the Carver Rapid Muller, you get a batch *every 75 seconds*!

COMPARE PERFORMANCE

Absolutely NO lumps or wet spots. Each grain of sand receives an equal coating of binder.

COMPARE CONVENIENCE

Patented self-cleaning mixing arm eliminates back-breaking cleaning chores.

COMPARE VERSATILITY

Carver Rapid Muller does a first-class job with molding sand, oil sand, resin sand, or CO_2 sand . . . any kind of binder.

COMPARE COST

Your initial investment is three times lower than most mixers . . . yet you save as much as 30% in binder. Extreme simplicity of design, with only one moving part, keeps maintenance costs at a bare minimum.

THESE ARE THE FACTS

Now you know why the Carver Rapid Muller is THE MOST FANTASTIC BUY IN THE BUSINESS — and why over 4,000 Carver Rapid Mullers are now in use. If you want an "on-the-spot" comparison — mail coupon today and SEE FOR YOURSELF why nothing — absolutely nothing — compares with Carver Rapid Muller.

WRITE OR CALL TODAY FOR COMPLETE DETAILS

Only CarVer Has Everything For the CO_2 Process!

CARVER V & S Core Shooters

CARVER Automatic Gassing Apparatus

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STEINEX available only from **CARVER**

MAIL TODAY

CARVER FOUNDRY PRODUCTS CO.
Muscatine, Iowa

We're interested! Rush information on Carver Rapid Muller.

NAME _____ TITLE _____

FOUNDRY _____

CITY _____ STATE _____

Circle 565 on Page 45

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Then you should have known about Midwest's SAME DAY SERVICE

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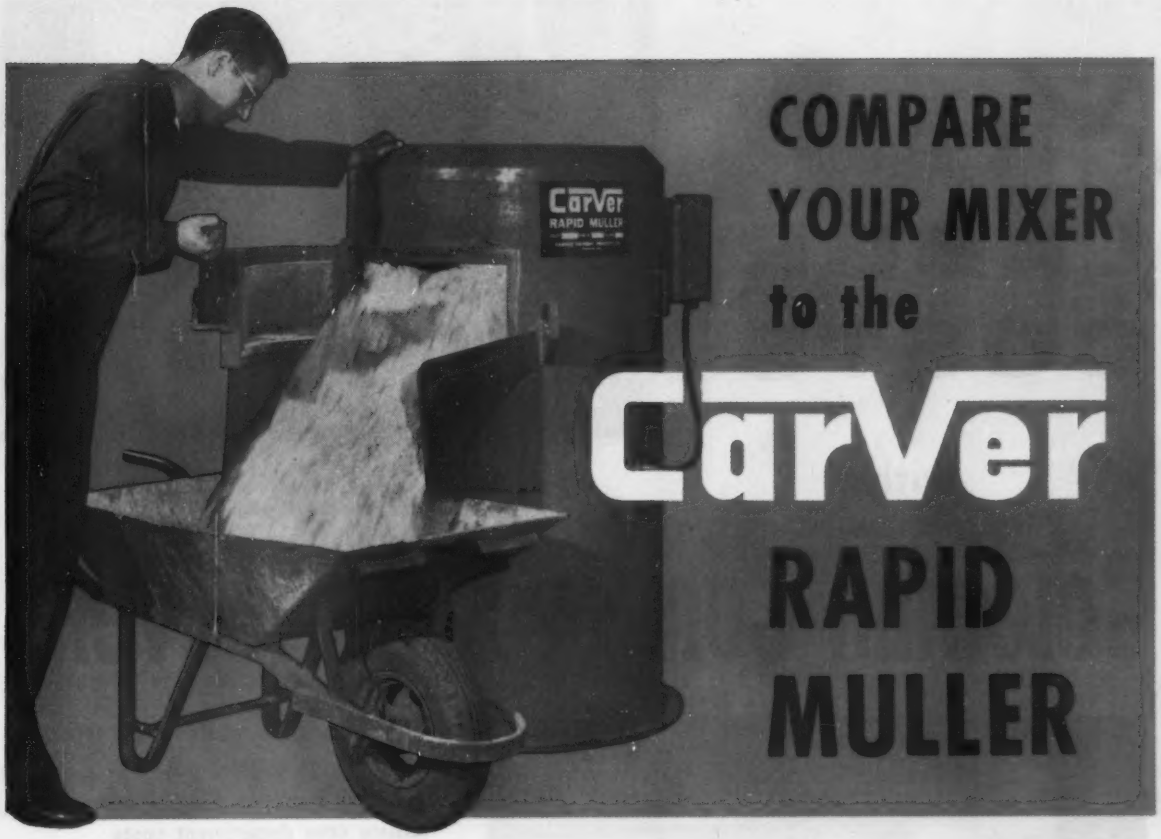

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CARVER V & S Core Shooters

CARVER Automatic Gassing Apparatus

KRAUSS Taper Slot Core Vents

STEINEX available only from CARVER

MAIL TODAY

CARVER FOUNDRY PRODUCTS CO.
Muscatine, Iowa

We're interested! Rush information on Carver Rapid Muller.

NAME _____ TITLE _____

FOUNDRY _____

CITY _____ STATE _____

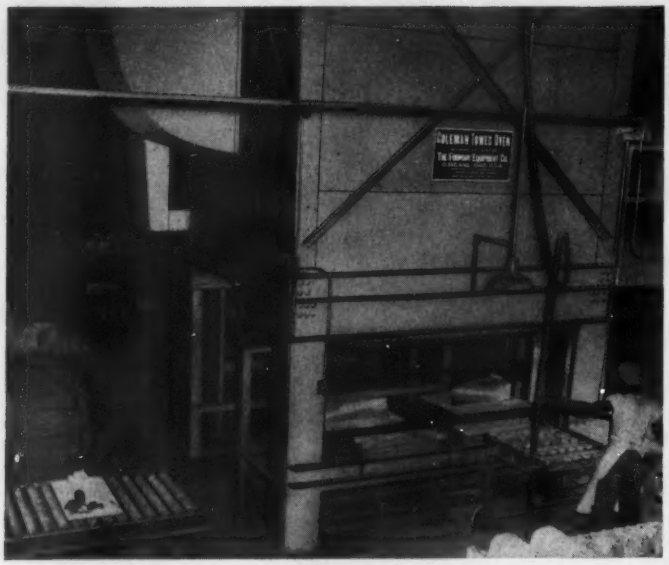
Circle 565 on Page 45

CUT LABOR COSTS

with

Coleman Dielectric Core Oven in leading plumbing fixture foundry. Direct labor alone reduced by 75%, with many other important savings and advantages.

Coleman Conveyor Core Ovens



Coleman Tower® Core Oven. One of two large installations in a major steel foundry. Mechanized handling and baking of cores up to 150 pounds at substantial annual savings.

● **Performance records in all types of foundries prove that Coleman Conveyor Core Ovens reduce core department costs by as much as 50%!**

Coleman Ovens quickly pay for themselves out of direct savings in labor, materials and reduced casting scrap.

As builders of the world's only complete line of foundry ovens . . . dielectric or recirculating heat . . . we can recommend, without bias, the right oven for your particular needs.

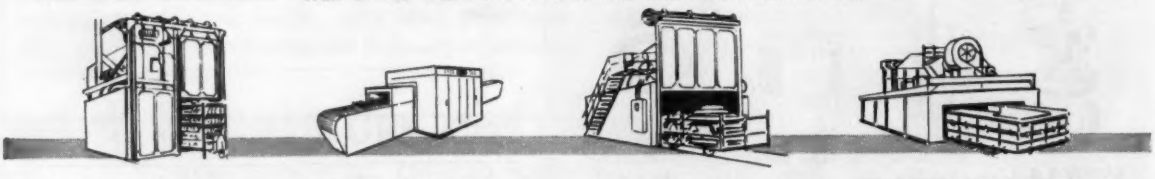
WRITE FOR BULLETIN 54

FEMA

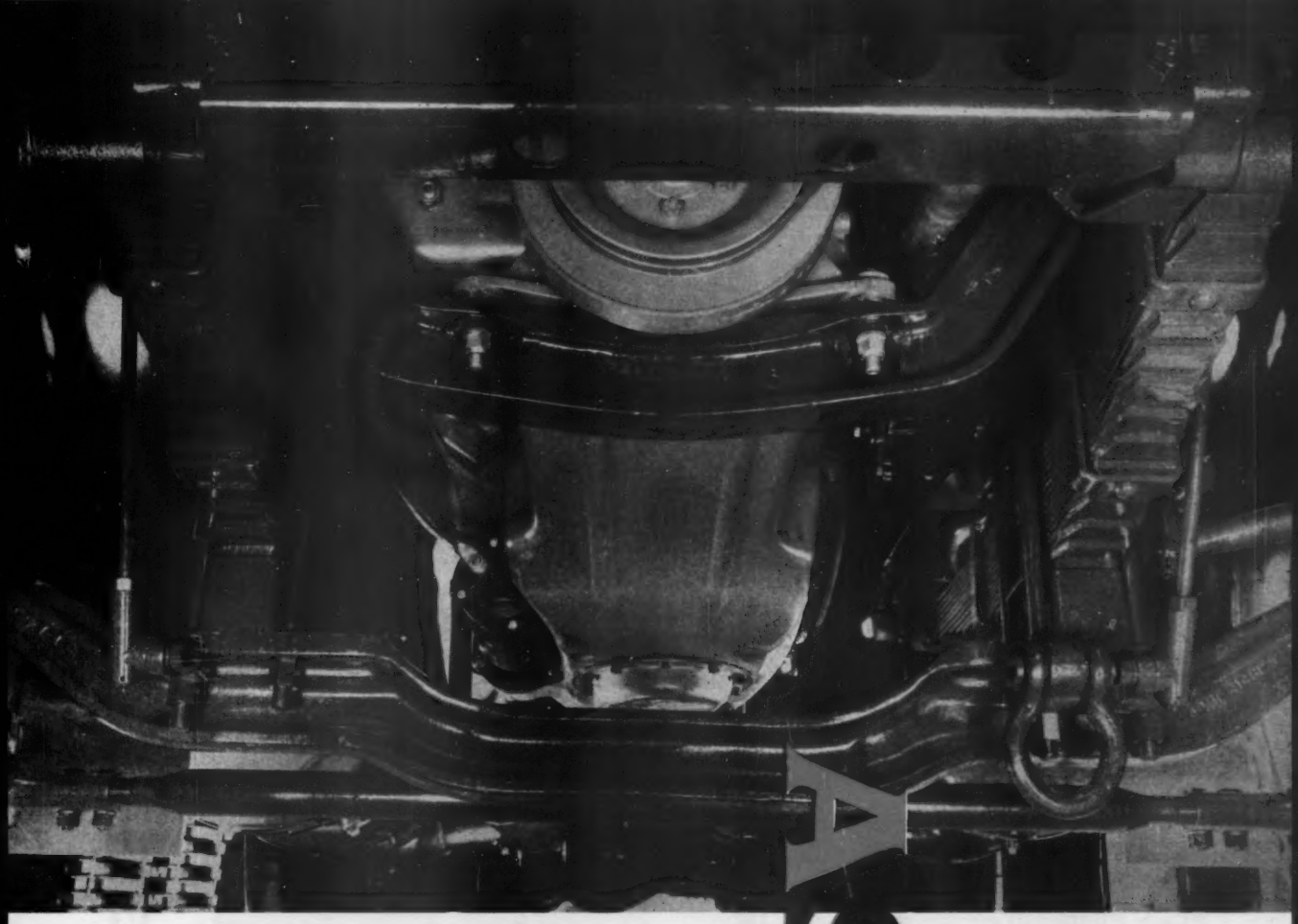
THE FOUNDRY EQUIPMENT COMPANY • **1821 COLUMBUS ROAD, CLEVELAND 13, OHIO**

World's Oldest and Largest Foundry Oven Specialists—More than half a century of specialized foundry experience.

PART OF THE WORLD'S ONLY COMPLETE LINE OF FOUNDRY OVENS



TRANSRACK OVENS | DIELECTRIC CORE OVENS | CAR TYPE OVENS | JET ACTION MOLD OVENS



Tenzaloy frame supporting front of heavy truck engine, is one of several truck engine parts now cast of Tenzaloy for high strength without weight.

High yield strength at low cost:

TENZALOY

THE SELF-AGING ALUMINUM ALLOY

If your aluminum castings are too large or too intricate for heat treatment, if your heat treating facilities are limited, if you need high strength without costly heat-treating, specify "Tenzaloy"—developed by Federated to meet the need for a superior aluminum alloy that ages at room temperature. Tenzaloy eliminates rejects due to warpage, expansion, and internal stresses caused by quenching. Tenzaloy finished properties are stable, proved by conclusive test data over a ten year period. No special foundry techniques are required. No fluxes. Castability is excellent with sand, plaster molds and many permanent molds. Tenzaloy will not "grow," produces corrosion-resistant castings with excellent polishing characteristics and anodizes clear white. Write for TENZALOY Bulletin No. 103 to: Federated Metals Division, American Smelting and Refining Company, 120 Broadway, New York 5, N. Y. or call your nearest Federated sales office.

ASARCO

AMERICAN SMELTING AND REFINING COMPANY

FEDERATED METALS DIVISION

Where to call for information:

ALTON, ILLINOIS
Alton: Howard 5-2511
St. Louis: Jackson 4-4040

BALTIMORE, MARYLAND
Orleans 5-2400

BIRMINGHAM, ALA.
Fairfax 2-1802

BOSTON 16, MASS.
Liberty 2-0797

CHICAGO, ILL. (WHITING)
Chicago: Essex 5-5000
Whiting: Whiting 826

CINCINNATI, OHIO
Cherry 1-1678

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Prospect 1-2175

DALLAS, TEXAS
Adams 5-5034

DETROIT 2, MICHIGAN
Trinity 1-5040

EL PASO, TEXAS
(Asarco Mercantile Co.)
3-1852

HOUSTON 29, TEXAS
Orchard 4-7611

LOS ANGELES 23, CALIF.
Angelus 8-4291

MILWAUKEE 10, WIS.
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Tuxedo 1-4109

NEWARK, NEW JERSEY
Newark: Mitchell 3-0500
New York: Digby 4-9460

PHILADELPHIA 3, PENNA.
Locust 7-5129

PITTSBURGH 24, PENNA.
Museum 2-2410

PORTLAND 9, OREGON
Capitol 7-1404

ROCHESTER 4, NEW YORK
Locust 5250

ST. LOUIS, MISSOURI
Jackson 4-4040

SALT LAKE CITY 1, UTAH
Empire 4-3601

SAN FRANCISCO 24, CALIF.
Atwater 2-3340

SEATTLE 4, WASHINGTON
Main 3-7160

WHITING, IND. (CHICAGO),
Whiting: Whiting 826
Chicago: Essex 5-5000

IN CANADA: Federated Metals Canada, Ltd.
Toronto, Ont., 1110 Birchmount Rd., Scarborough, Phone: Plymouth 73246

Montreal, P.Q., 1400 Norman St., Lachine, Phone: Melrose 7-3591

Circle 567 on Page 45

International Minerals & Chemicals

A REPORT TO FOUNDRIES

FROM TOM BARLOW

Reducing diet for castings

Everyone seems to have a pet diet (or has had one lately). All you have to do is put on a few pounds and you'll get more advice than you can possibly use. I just read about the last word in quick-reducing methods. It is utterly simple — just gin and cigarettes — no food. It is guaranteed to take off 50 pounds — just before you die (unless you die prematurely).

Castings need a diet, too. Overweight castings do no one any good — they cost everyone money. You, the customer, the machine shop: all get taken. Just for example, overweight castings (like overweight people) are always overfed. They have to be. Overfeeding (foundrymen refer to risers, feeders or headers) a casting reduces yield. Lower yield means lower profits — and on and on. If you want better yield, reduce mold-wall movement — make castings closer to pattern size—and reduce casting weight.

As with any diet, the technique is basically simple. For humans it means eating less food. With castings, it merely means using stronger sand and/or more molding energy. The only catch is how to do this as painlessly as possible. Let's see what takes place — see if a painless method will show up.

If sand grains could talk, they might adopt the motto, "United we stand—divided we fall." Sand strength is the result of togetherness. Clay imparts strength largely because it permits the sand grains to pack together. Pick up a handful of Black Hills Bentonite and wet it. It is slippery like soap—not sticky like glue. High-strength sands are flowable — almost by definition. They are strong because they are flowable to the point that the grains pack

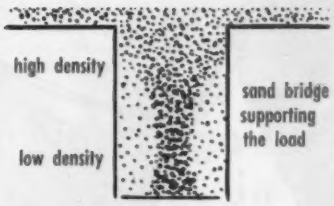
together tightly. Why then do we back up on strength to get a "more flowable" sand? A simple test illustrates the answer — and the secret of our reducing diet for castings.

If we use a simple pattern involving a pocket, we can study the effect of strength, ramming, sand additives and many other factors. Such a pattern might look like this:

It should have a simple pocket — not too hard to ram, but not too easy, either. A pocket 2 inches wide, 6 inches long and 3 inches deep is as good as any. There is no standard for this test. If we start with a sand of about four pounds strength and gradually increase the strength, we can measure a very definite change. Using a standardized method and energy of squeeze, jolt, sling, hand ram or what have you, we find:

1. The mold hardness on the flat areas will increase — indicating an increase in flowability (or better, moldability) with increasing strength.
2. The mold hardness of the sides and bottom of the pocket will increase up to some point — and then suddenly decrease.

At the point of decrease we have reached the strength of bridging. The flowability of the sand has increased to the point where the sand rams itself into a bridge and prevents further flow into the bottom of the cavity.



So the molder asks for weaker sand — *but not to gain flowability*. He wants to lose flowability and avoid the forming of a bridge! When he accomplishes this, he also loses all these advantages of strong sand:

Better yield	1. Better finish	Better yield
	2. Less mold breakage	
	3. Reduced casting weight	
	4. Faster molding	
	5. Easier (cleaner) core setting	
	6. Fewer defects	

In other words, his castings get fat. They require more feeding — which makes them even fatter. Yield is down—profits are down.

How to break the bridge without reducing strength? How do we stick to the diet of strong sand? Ram harder? Yes, this makes sense. (Hence, high-pressure molding.) But for every machine there is still a point at which the sand will bridge.

This characteristic of sand can be changed. That is the reason for PLASTI-BOND, TRIPLACT, Z-FLO and MAPLEX. The correct one for your application can be determined easily. Our engineers now have a lot of background to help you. For example, a 14-lb. sand with PLASTI-BOND will ram solid where a 9-lb. sand without it may bridge. The additive is the little extra (that clays alone do not have — even our clays) that lets your castings successfully stay on the reducing diet they need.

Raising the strength without using additives is like cutting down on potatoes but not on gravy — nothing happens. Sometimes (unfortunately) adding things like PLASTI-BOND without raising the strength is like cutting down on gravy but not on potatoes — it just ain't enough. Fortunately, the addition of PLASTI-BOND, Z-FLO or TRIPLACT normally raises the strength automatically (and by design). The secret is to keep the strength up — or even raise it.

We have all the ingredients for a successful diet for your castings. We also have the "doctors" to make the diet as effective as possible. Do you have the need?

Products for Growth*

IMC

*Trademark

EASTERN CLAY PRODUCTS DEPT.

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- **Vision plus Ventilation**
- **High Protection from Impact or Heat**
- **Window Replacement Economy**

This is the face shield that lets workers see well and keep cool at the same time. The clear window portion* is now supplied standard with .040″ thick acetate for additional impact protection.

Durable screen portion is 24 mesh. The resultant added ventilation helps a man's skin "breathe" on hot jobs. He'll benefit from any moving air. For operations where extreme impact is a problem, our .060″ thickness acetate is recommended. Turnbuckle arrangement on sides of .060″ window anchors safely. Back headband of the Kool-Vent is adjustable. For more information write for folder S-9033.

*Smaller than a full size window, it is more economical to replace.

AO 283 KOOL-VENT
Face Shield

American Optical
COMPANY
SAFETY PRODUCTS DIVISION
SOUTHBRIDGE, MASSACHUSETTS
Safety Service Centers in Principal Cities

For the Right Touch on Production Welding ...this AO Elkskin Glove

Very soft, very flexible — for jobs where sensitivity of touch is a must. These gloves reduce hand fatigue and will give plenty of "mileage" despite high temperatures. Montpelier pattern, one-piece back and palm, all welted seams, heavy lining on back, 14″ long.

5 x 311 ELKSKIN GLOVE

Always insist on Ⓐ Trademarked Safety Products. Your Nearest AO Safety Products Representative can supply you.

Your Surest Protection... AO SURE-GUARD Products

Circle 569 on Page 45

The first HANDY SANDY, installed at Michigan Wheel Company in 1950.

Today's modern foundry at Michigan Wheel Company, automated with six double HANDY SANDY units, and six REDDY SANDY units.

Michigan Wheel Company of Grand Rapids, Michigan, replaced hand shoveling with the first HANDY SANDY built in 1950, for casting boat propellers. Before installing the HANDY SANDY, one molder shoveling produced 50 to 55 molds per day. With the HANDY SANDY the same molder turned out 90 to 100 molds per day, and "still felt like working another shift."

Today, Michigan Wheel Company has the installation of six double units of HANDY SANDYS, shown above, which parallels the growth of this company's foundry operations since 1950, and this growth has led to the entirely new foundry.

Further Proof of Newaygo's Leadership in "packaged" Sand Handling Units.

Low capital investment for HANDY SANDYS permits progressive foundry mechanization—*and* savings with each unit help pay for additional units!

Cadey Aluminum Foundry Company of Grand Rapids, Michigan, invested in these two EHS Model HANDY SANDYS in 1960, to automate the production of heavy duty, high quality aluminum castings. These "big brothers of the HS Model" handle up to 20 tons of sand capacity per hour per unit.

The EHS Model HANDY SANDY has 8-inch by 5-inch cast buckets; 10-inch wide rubber-covered elevator belt; cast head and tail pulleys; heavy duty antifriction bearings throughout; cutting blade type of aerator with separate motor drive.

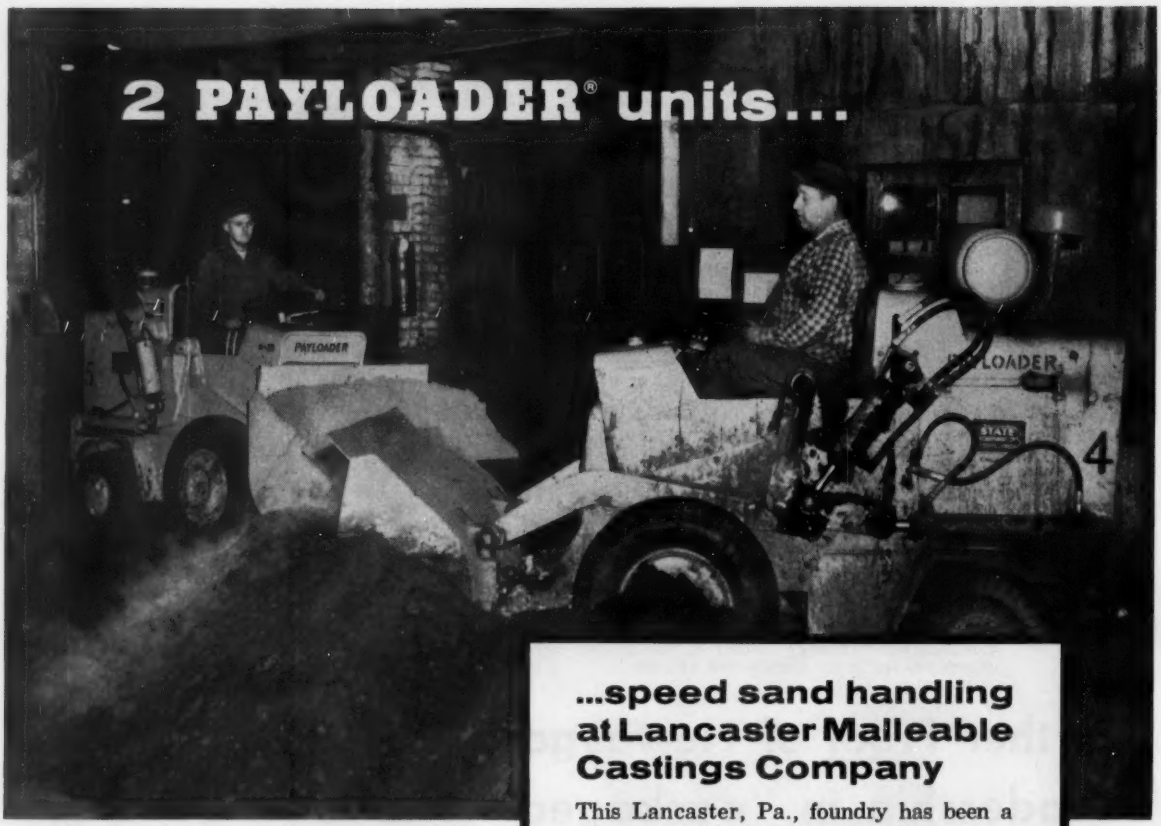
Performance and durability are built into every piece of Newaygo equipment. Write, phone or wire for a Newaygo Representative to help you.

These will help YOU

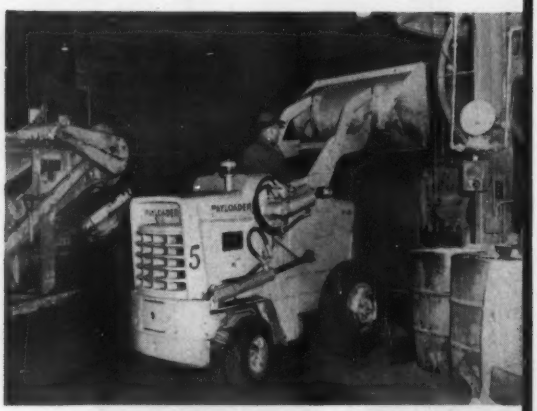
MOVIE "Progressive Mechanization", featuring HANDY SANDYS in 9 foundries . . . . MOVIE "Newaygo Pallet Systems for Mold Handling", many types of installations in foundries . . . Our magazine "SAND SCRIPTS" . . . Bulletins: No. 60 on Pallet Line Systems of Mold Handling . . . No. 59 on HANDY SANDYS . . . No. 56 on Newaygo Sand and Mold Handling and Mold Making Equipment.

NEWAYGO

Circle 570 on Page 45



Lancaster's two H-25's windrow and mix sand on pouring floor — carry and feed to the separator — feed the muller—return sand to 58 molding stations — carry slag to dump — unload boxcars of sand.



...speed sand handling at Lancaster Malleable Castings Company

This Lancaster, Pa., foundry has been a "PAYLOADER" booster ever since its first one, a Model HA, went to work in 1948. Since January 1959, two of the new H-25 Models have been placed in operation. Says Clarence Hess, Foreman, "Our first H-25 had worked some 2,200 hours before we added the second one. We find these H-25's have twice the production of old HA's. They are much easier on the operator and give all-around efficient operation, because of their faster load delivery cycle and greater carrying capacity. They have outstanding maneuverability."

At Lancaster Malleable the night shift uses the H-25's to handle about 90 tons of sand four times during separate stages of stockpiling, mixing, feeding the separator and transporting sand to the 58 molding stations. The day shift uses one machine to handle slag and unload boxcars of sand.

Foundries and plants of all kinds have found that the Model H-25 is the answer for more efficient indoor bulk handling. Interchangeable attachments are also available for special jobs: sweeper, fork lift, hydraulic grab, crane hook. Write for complete data.

HOUGH®

THE FRANK G. HOUGH CO.
LIBERTYVILLE, ILLINOIS
SUBSIDIARY — INTERNATIONAL HARVESTER COMPANY

HOUGH, PAYLOADER, PAYMOVER, PAYLOGGER and PAY are registered trademark names of The Frank G. Hough Co., Libertyville, Ill.

THE FRANK G. HOUGH CO. 8-A-3
703 Sunnyside Ave., Libertyville, Ill.

☐ Send H-25 "PAYLOADER" data

☐ Larger units to 12,000 lb. capacity

Name.....

Title.....

Company.....

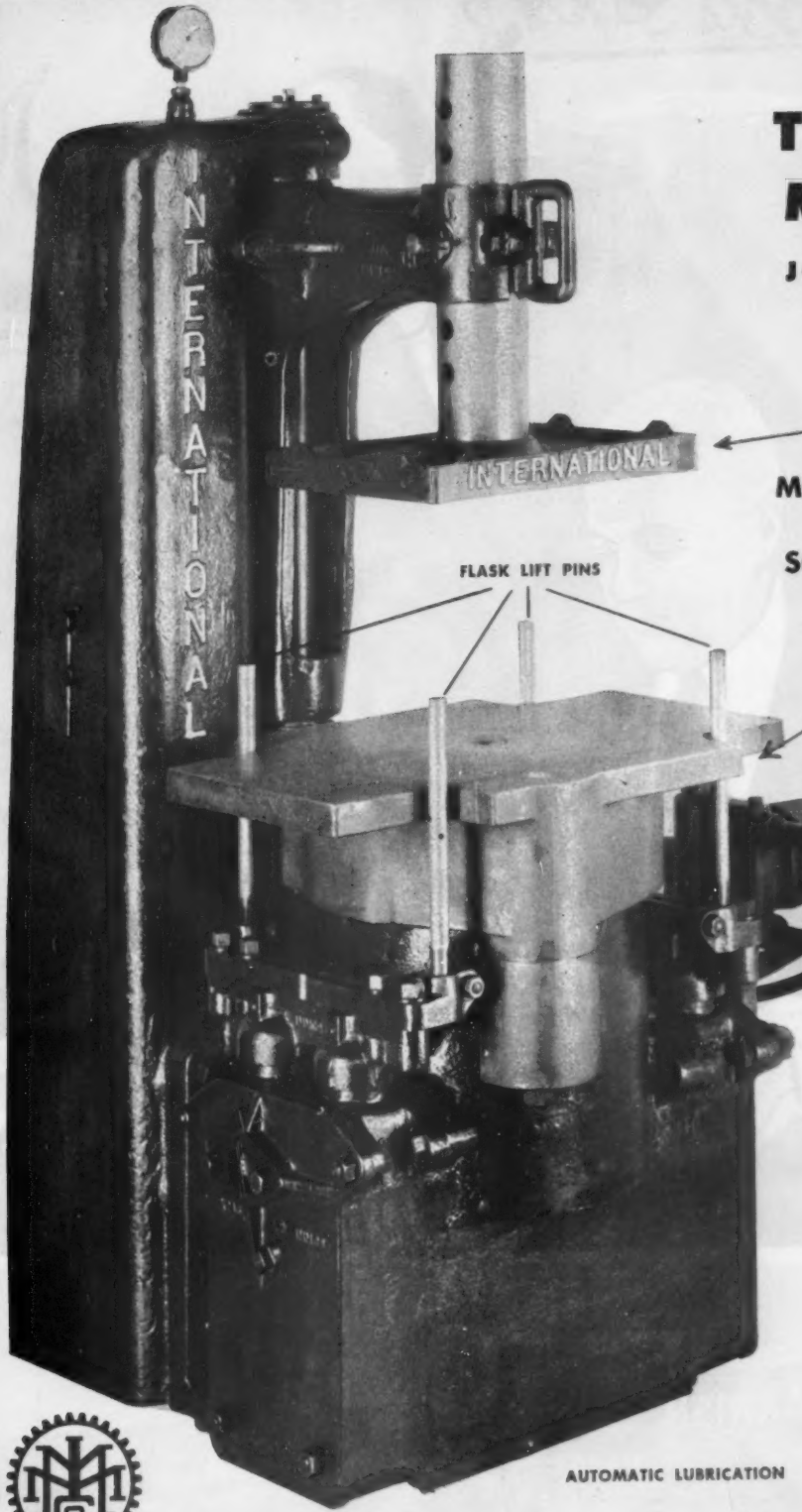
Street.....

City.....State.....

Circle 571 on Page 45

Circle 572 on Page 45→

INTERNATIONAL



TYPE PKL MACHINE

JOLT, SQUEEZE, AIR PIN LIFT

ADJUSTABLE PLATEN

Made with 12" and 14" Diameter SQUEEZE CYLINDER

FLASK LIFT PINS

VIBRATOR VALVE

JOLT VALVE

DRAW VALVE

SQUEEZE VALVE

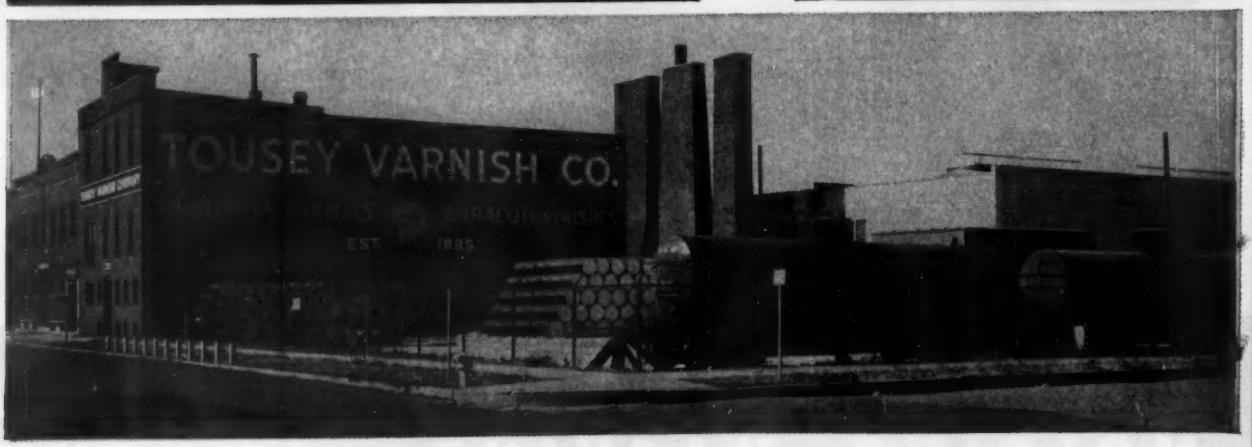
AUTOMATIC LUBRICATION

Built Right- Priced Right!

"There is an INTERNATIONAL for every job"

Internationals are designed and built by experienced Foundry Engineers who have a practical knowledge of the problems of the foundry business.

INTERNATIONAL
MOLDING MACHINE COMPANY
LA GRANGE PARK, ILLINOIS


TOUSEY VARNISH CO.

Our 75th year

CHAPTER THREE

Today, Tousey stands as a company 75 years young looking to the future with confidence. Under the guidance of Carl R. Heagstedt, who became president in 1954, Tousey in a stepped-up expansion program built a new manufacturing plant in East Moline, Illinois and acquired a subsidiary in Cleveland, Ohio during the past two years. These new outlets afford excellent service to various large manufacturing centers in their areas and place Tousey products in an ever widening circle across the country.

In this same spirit of expansion Tousey laboratories are developing new products to offer industry, while at the same time working steadily toward improvement of the present Tousey line of finishes.

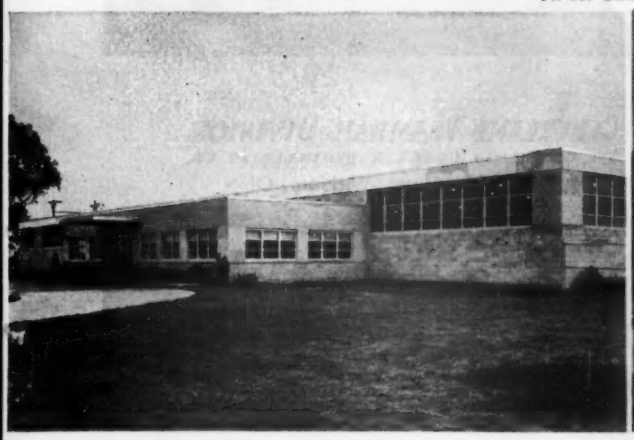
Thus today we find a full-grown company established on a basis of good customer relationship and a devotion to the quality of its products. An earnest desire on the part of management to continue this program at all costs will undoubtedly prove a successful formula for continued expansion.

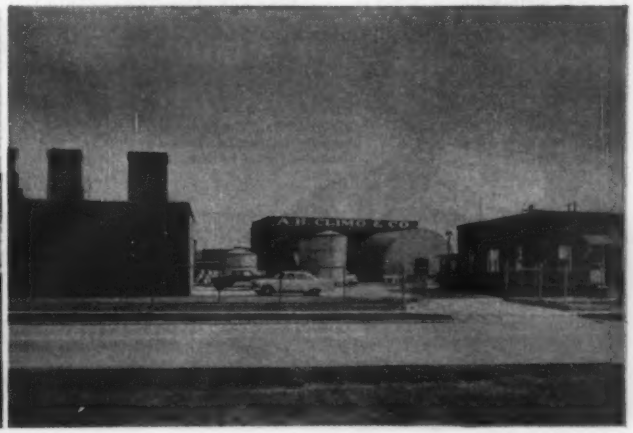
OUR 75th YEAR
1885-1960
TOUSEY PRODUCTS
DURACOTE for DURABILITY

Tousey Varnish Company manufactures a full line of finishes for application by Dipping, Flo-coating, Hot Dipping, Automatic Spray, Electrostatic Spray, Airless and Hot Spray. Tousey is a major supplier of finishes to manufacturers of Farm Machinery, Road and Construction Machinery, Automobiles and Trucks, and to other representative manufacturers of products made of metal.

TOUSEY VARNISH COMPANY

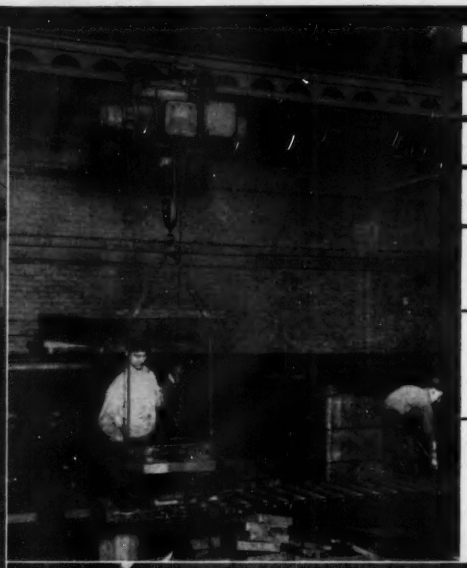
Chicago Division: 520 WEST TWENTY-FIFTH STREET • CHICAGO 16, ILLINOIS
Quad-Cities Division: 2500 EIGHTH AVENUE • EAST MOLINE, ILLINOIS
A. H. Climo Division: 16908 WATERLOO ROAD • CLEVELAND, OHIO

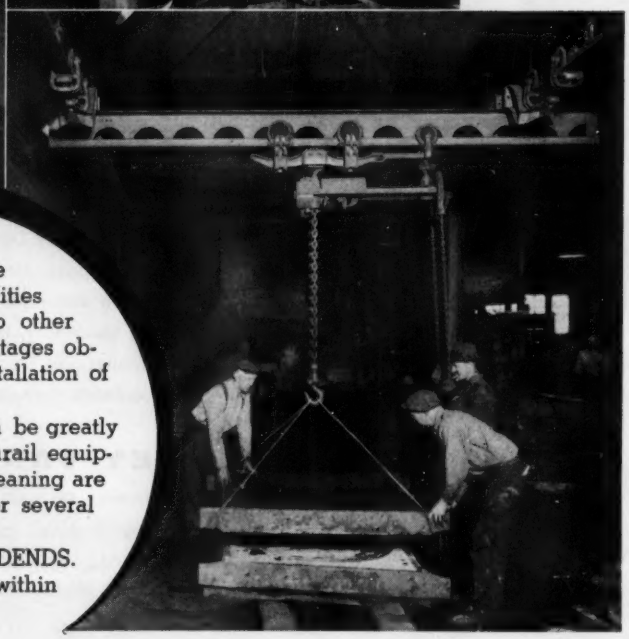




Circle 573 on Page 45

SPEED MOLD-MAKING
the efficient Cleveland Tramrail Way





Wherever materials of any kind in a foundry are lifted, moved or handled, there usually are possibilities for effecting important economies. Probably in no other way can so much be saved and as many advantages obtained for such a small investment as through installation of proper materials handling equipment.

Mold-making is one of the many jobs that can be greatly eased and speeded with overhead Cleveland Tramrail equipment. Pouring, sand-handling, cupola-charging, cleaning are others. Often the same equipment can be used for several different purposes.

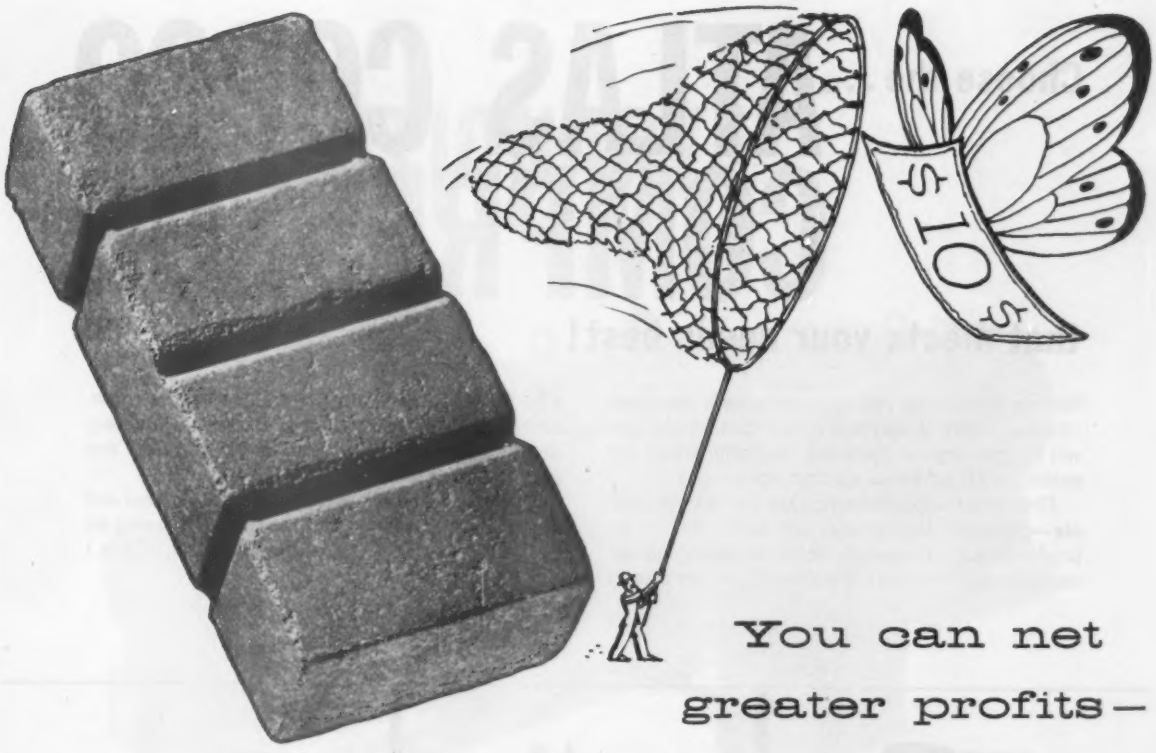
Cleveland Tramrail pays dividends—BIG DIVIDENDS. Most installations pay for themselves out of savings within one year; some in less than six months.

GET THIS BOOK!
BOOKLET No. 2008. Packed with valuable information. Profusely illustrated. Write for free copy

CLEVELAND TRAMRAIL DIVISION
THE CLEVELAND CRANE & ENGINEERING CO.
3806 East 286 Street, Wickliffe, Ohio

CLEVELAND TRAMRAIL
OVERHEAD MATERIALS HANDLING EQUIPMENT

Circle 574 on Page 45

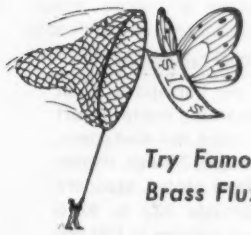


You can net greater profits—

use *Famous* CORNELL CUPOLA FLUX for Gray Iron and Malleable Foundries

Famous Cornell Cupola Flux purifies metal by chemically reacting with the molten mass to increase fluidity of iron and slag. Castings are free from hollow centers and hard spots. They have greater tensile strength and machining is easier.

Famous Cornell Cupola Flux costs just cents per ton charge of iron. Hundreds of gray iron and malleable foundries use this famous flux each operating day. You can, too. Write for Bulletin 46-B.



Try Famous Cornell Aluminum, Copper, Brass Flux – if you melt these metals.

don't accept substitutes

The CLEVELAND FLUX Company

1026-40 MAIN AVENUE, N. W. • CLEVELAND 13, OHIO

Manufacturers of Iron, Semi-Steel, Malleable, Brass, Bronze, Aluminum and Ladle Fluxes—Since 1918

FAMOUS CORNELL FLUXES

Trade Mark Registered

Circle 575 on Page 45

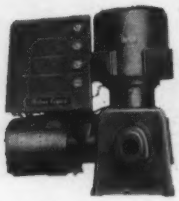
Choose the... ATLAS COPCO COMPRESSOR

that meets your needs best!

No one compressor can meet everyone's demands. However, there is an Atlas Copco compressor that will fit your requirements and no matter which you select, you'll get these specific advantages:

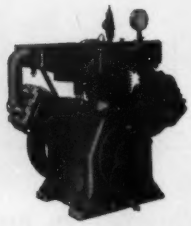
First, Atlas Copco compressors cost less to operate—consume less power per cubic foot of air produced than comparable units. Secondly, maintenance problems are at a minimum. One user reports a $3.10 expenditure after 10,000 hours' operation. And thirdly, you're **guaranteed** the free-air delivery we quote you—no "almost's" or "close to's". You get what you order!

Check the representative models shown here and then mail the coupon for a free catalog showing all the facts and figures! (No obligation, of course.)



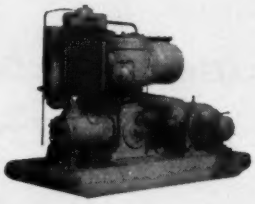
ER-6 Heavy-Duty Compressors

New! Fundamental improvements provide these three big advantages: (1) Only 18.3 hp required per 100 cfm at 100 psi, full load—10 to 15% lower than most compressors of this size! (2) Completely enclosed functional design protects external lines and fittings. (3) Extremely small space and simple concrete block required for permanent fixing—save on floor space, material and labor! Capacities to 1,140 cfm.



CT Air-Cooled Compressors

Stationary, or skid-mounted compressors for use where air demand is between 50 and 300 cfm. Totally air-cooled. Cylinder arrangement designed for smooth, vibration-free operation. Compact, rugged—for continuous, 24-hour trouble-free service. Highly efficient; low on maintenance costs.



AR-L Heavy-Duty Compressors

Same basic construction as the AR Series, but provided with an air-cooled intercooler and air-cooled radiator for the cylinder water. Fan on compressor flywheel cools radiators. Perfect for arid areas or where difficult to bring in water. Both stationary and skid-mounted models available.

FREE!

Write today for your free copy of our short-form catalog, describing the line of Atlas Copco stationary compressors. Ask, too, for detailed information on the model you need most. Use the handy coupon below.

ATLAS COPCO
Dept. FO-6, 545 Fifth Avenue
New York 17, N.Y.

Gentlemen:

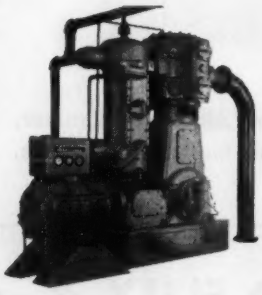
Please send me ☐ Short-form catalog
☐ Detailed information on the _____ Series

Name _____ Title _____

Firm _____

Address _____

City _____ Zone _____ State _____



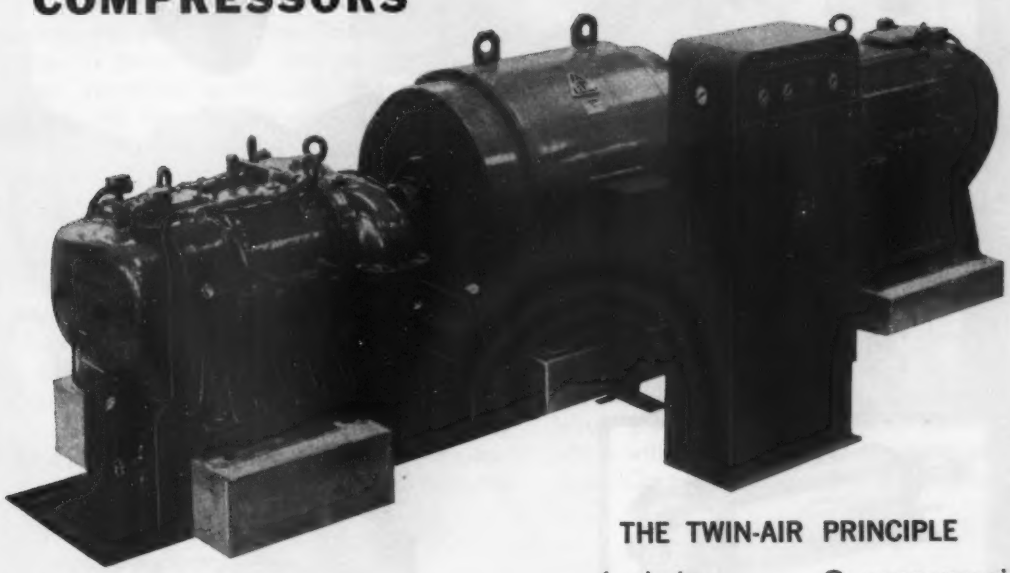
AR Heavy-Duty Compressors

More air per horsepower than any comparable compressor! For continuous, full-load operation. "L" angle, 2-stage, double acting. Water cooled. Standard models provide 382 to 3210 cfm free-air delivery at 100 psi; only 76-590 hp required! (Can be supplied for other working pressures on request.)

Atlas Copco Atlas Copco

REVOLUTIONARY!

TWIN-AIR COMPRESSORS

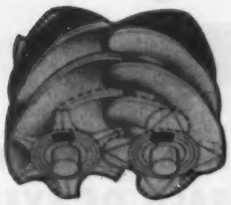


A basic departure in compressor design, employing precision-mounted helical rotors, with small clearances maintained by timing gears, thus eliminating friction (and the necessity for oil) in the compression chamber. "Twin-Air" Compressors offer surge-free delivery from 6,000 to 19,400 cfm at working pressures up to 115 psi. And, you get completely oil-free delivery of air or gas, since no lubrication is required!

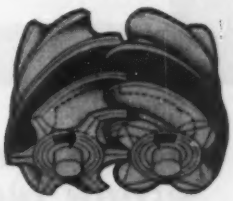
OPERATION: Air Intake: Air is drawn through the inlet into the space between lobes and housing. **Compression:** Motor revolves, sealing inlet and beginning compression of the enclosed air. Rotary motion continues, producing smooth compression, until each groove in turn reaches outlet port. **Air Outlet:** Pulsation-free compressed air is forced smoothly out of compressor and outlet is set again for the next cycle.

THE TWIN-AIR PRINCIPLE

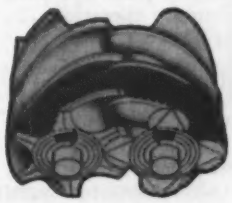
1. air in



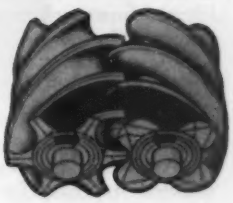
2. compression



3. compression



4. air out



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610 Industrial Avenue
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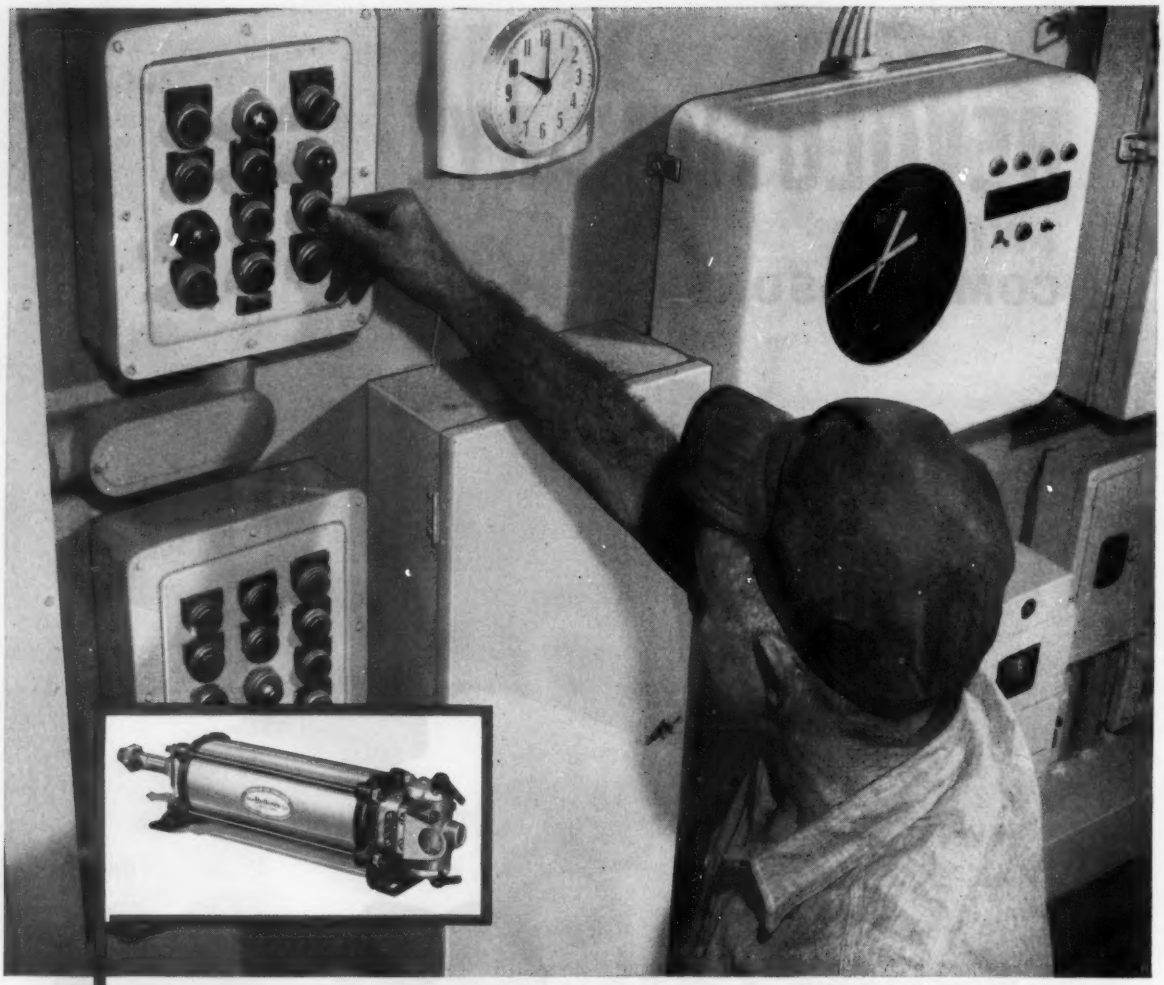
Circle 576 on Page 45



THE BELLOWS AIR MOTOR PUTS PRACTICAL AUTOMATION WITHIN THE REACH OF EVERY FOUNDRY

A Bellows Air Motor can do the push and pull, lift and turn work in many foundry operations . . . and do it in less time and at less cost.

The picture shows a typical example:

Proportioning and feeding mold sand materials to mullers with hand shovels is common practice in many foundries. Wehr Steel Co. of Chicago, decided its costs for this work were too high. Automatic dispersal of the materials was accomplished with a company designed storage and feeding system.

Now as the mullers need material, an operator provides it by pushing buttons . . . Bellows Air Motors do the work of opening and closing five storage bins located two stories above the mulling floor.

In your operations, too, there are scores of ways in which these ingenious air cylinder power units can be combined with a little imagination to save money. Packing a lot of "controlled power" in a small space, Bellows Air Motors will perform virtually any pull, push, lift or turn motion quicker, safer and more reliably than it can be done by hand or by cams, gears, levers or other mechanical aids. They put practical cost-saving automation within easy reach of every size foundry.

Your Bellows-Valvair Field Engineer will be glad to discuss possible applications with you. Or write Bellows-Valvair, Dept. FO-860, Akron 9, Ohio, for copies of Bulletins ML-3 and BM-25. In Canada, address Bellows-Valvair, Ltd., Toronto 18, Ontario.

Bellows-Valvair

The Bellows Co. • Valvair Corp. *Akron 9, Ohio*

DIVISIONS OF INTERNATIONAL BASIC ECONOMY CORPORATION (IBEC)

1067B-3

Circle 577 on Page 45

Late News

TRENDS: Shipments of castings in the first half of this year showed divergent trends compared with the 1959 period. Gray iron tonnage was off about 10 per cent, steel shipments were practically a standoff, and malleable, brass and bronze, and aluminum deliveries dropped 5 per cent or slightly more. The decrease for all castings is estimated at 8 to 9 per cent.

Comparisons with last year will become more favorable as the third quarter progresses, due to the depressing influence the 1959 steel strike had on steel and gray iron castings demand a year ago.

In the second half, consequently, ferrous foundries need only to duplicate their shipments of the first six months for the 1960 total to equal or exceed that of 1959. Nevertheless, a fairly substantial fall upturn will be required if the 10 per cent business gain predicted by the industry at the opening of this year is to be realized.

FOUNDRIES SOLD: Mueller Industries Inc., Wausau, Wis., has purchased the foundry facilities of Koehring Div., Koehring Co., at 3042 W. Locust St., Milwaukee, and will move its Love Bros.-Pyott Foundry in Aurora, Ill., to the former Koehring facilities. Mueller Industries also operates Sterling Casting Co., Bluffton, Ind., and owns Midwestern Foundries, Garrett, Ind., of which Badger Malleable & Mfg. Co., South Milwaukee, is a wholly owned subsidiary.

Casting Engineers, Chicago, has purchased Jelrus Precision Casting Corp., New York, which will continue to operate under its own name. Casting Engineers is a division of Con-

Foundry Statistics

Iron and Steel Scrap Consumption

(Gross tons*)

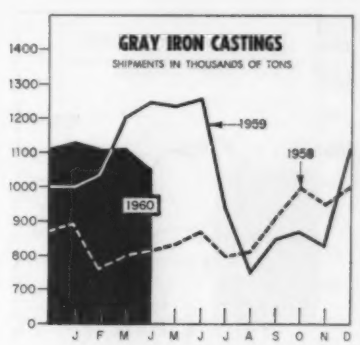
	All Scrap Total	By Types of Furnace — Cupola Total	Air Total	Electric Total
1958	50,242,746	7,725,970	821,388	7,152,726
1959				
Feb.	5,657,873	791,137	88,326	801,692
2 mo.	11,032,915	1,574,182	174,845	1,568,981
Mar.	6,677,499	873,982	101,986	965,048
Apr.	6,644,905	911,313	106,972	996,126
May	6,642,572	868,661	99,256	1,029,573
June	6,322,404	885,497	104,683	997,921
July	3,584,931	750,208	87,441	603,726
Aug.	1,875,165	691,786	81,184	374,678
Sept.	2,114,015	801,588	99,090	441,134
Oct.	2,266,709	798,569	98,279	445,137
Nov.	4,796,896	614,233	82,784	801,555
Dec.	7,021,870	843,040	99,577	1,008,158
Total	58,979,881	9,613,059	1,156,097	9,232,037
1960				
Jan.	7,043,488	823,442	95,442	1,058,159
Feb.	6,493,558	822,476	97,688	1,015,716
2 mo.	13,537,046	1,645,918	193,130	2,073,875

Index of Foundry Equipment Orders

Foundry Trades Only
(Net Orders Closed, New Equipment)

	1959	1960
Jan.	127.4	95.5
Feb.	237.1	123.6
Mar.	166.6	159.9
Apr.	154.2	97.9
May	157.0	159.0
June	125.1	....
July	110.7	....
Aug.	134.1	....
Sept.	131.3	....
Oct.	140.8	....
Nov.	131.2	....
Dec.	95.9	....

Note: Base period 1947-49 taken as 100 per cent monthly average.
Source: Foundry Equipment Manufacturers Association.



GRAY IRON CASTINGS—SHIPMENTS

(Net tons[1])

	All Castings — Total	All Castings — For Sale	Miscellaneous Castings Total	Miscellaneous Castings For Sale	Nodular Iron Castings Total	Heavy Steel Ingot Molds Total	Chilled Railroad Car Wheels Total	Pressure Pipe & Fittings Total[2]	Soil Pipe & Fittings Total[2]	Unfilled Orders[3]
1958	10,371,232	5,863,154	6,155,378	2,657,197	117,588	1,884,396	265,114	1,277,685	788,659	.....
1959										
Apr.	1,245,702	688,755	726,105	295,982	14,663	270,476	35,655	129,861	83,605	892,214
4 mo.	4,488,556	2,389,549	2,695,352	1,084,184	53,224	956,460	130,160	389,710	286,969	.....
May	1,236,250	685,285	706,073	285,507	16,003	275,563	36,960	141,675	75,979	884,779
June	1,252,016	717,067	707,291	295,064	15,510	268,479	30,723	160,540	84,983	836,707
July	932,713	532,912	599,422	252,915	14,508	99,670	20,486	133,175	79,960	897,536
Aug.	743,564	506,756	485,444	254,232	11,046	13,482	18,479	145,853	80,306	872,993
Sept.	850,043	528,145	595,435	279,357	11,875	19,416	16,272	142,660	76,260	883,278
Oct.	871,779	520,322	622,599	277,927	17,797	20,155	19,647	139,716	69,662	886,970
Nov.	831,504	516,032	493,508	250,342	12,698	165,139	16,723	96,086	60,048	885,368
Dec.	1,107,741	584,516	650,145	271,221	14,651	294,129	20,595	92,139	50,733	845,575
Total	12,314,166	7,002,584	7,555,269	3,260,759	167,312	2,142,498	309,945	1,440,883	865,571	.....
1960										
Jan.	1,135,575	591,804	677,392	277,100	16,774	295,994	18,463	86,798	56,928	851,336
Feb.	1,107,721	571,143	678,927	279,190	16,430	284,738	17,848	76,332	49,876	855,324
Mar.	1,143,395	600,162	685,102	284,207	15,670	294,322	24,409	83,121	56,441	880,132
Apr.	1,051,357	580,590	609,234	258,994	13,980	232,895	21,737	118,886	68,605	834,495
4 mo.	4,438,048	2,343,699	2,650,655	1,109,491	62,854	1,107,949	82,457	365,137	231,850	.....

*Source: U. S. Dept. of Interior Bureau of Mines. [1]Source: Bureau of Census. [2]For sale only. [3]All cast iron pipe is shipped for sale.

Late News

solidated Foundries & Mfg. Co., Chicago, which owns other foundries in Michigan, New York, Ohio, and Wisconsin.

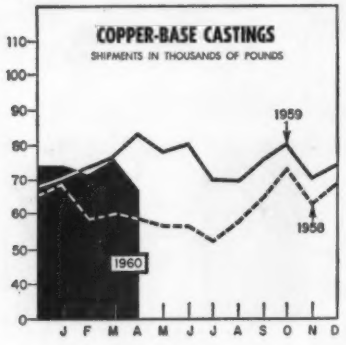
CAPITAL OUTLAYS: Industry is planning to step up its spending for new plant and equipment in the second half of 1960, but at a slower rate than in the first half, according to the government's latest quarterly survey. Outlays for 1960 now are projected at $36,850 million, which compares with $32,540 million in 1959. In terms of percentage of the gross national product, the 1959 figure was the lowest in 10 years, but the percentage now is on the way up.

PRIMARY ALUMINUM: Production of primary aluminum continues strong, with 515,815 tons turned out in the second quarter of 1960. This figure is less than 5000 tons under the record, set in the third quarter, 1959, and brings the total for the first half of 1960 to 1,007,353 tons.

ALUMINUM IN AUTOS: The light metal is being pushed for a great variety of new applications, but probably nowhere else more than in the automotive field. Indicative of this direction was the first truck shipments during July of molten aluminum from Aluminum Co. of America's reduction plant at Warrick, Ind., to General Motors Corp.'s Central Foundry Div. plant in Bedford, Ind., 115 hilly miles away. Eventually, Alcoa will supply up to 3000 tons per month to the GM plant. Word in Detroit has it that one of the new GM compacts next year will be powered by a V-8 aluminum engine. In addition, Chrysler is working hard on a diecast aluminum engine for its six-cylinder cars.

PERSONALS: Maurice J. Lippincott has been appointed general superintendent, Florence Pipe Foundry & Machine Co., Florence, N. J. . . . James F. Connaughton, president, Wheelabrator Corp., has also been named president and chief executive officer of its parent company, Bell Intercontinental Corp. . . . Robert L. Reed has been appointed general sales manager, Union Carbide Metals Co. . . . William T. McGinnis, recently vice president, Keokuk Electro-Metals Co., has been made executive vice president . . . William J. Stock has

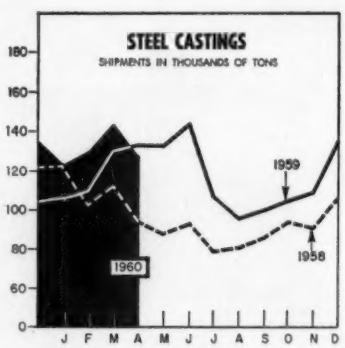
Foundry Statistics



COPPER-BASE CASTINGS

(Shipments of castings—1000 pounds[1])

	Shipments			
	Total	Sand	Perm. Mold	Unfilled Orders[2]
1958	762,484	697,360	31,854	.....
1959				
Apr.	82,799	73,567	4,640	29,941
4 mo.	304,317	269,863	16,733	.....
May	78,413	69,351	4,363	27,074
June	79,366	70,512	4,421	30,389
July	69,073	61,650	3,869	31,820
Aug.	68,979	60,346	4,410	32,117
Sept.	75,739	66,211	4,809	29,396
Oct.	79,832	69,583	5,172	28,092
Nov.	70,674	61,490	4,893	29,147
Dec.	73,558	64,579	4,337	29,243
Total	899,951	793,585	53,007	.....
1960				
Jan.	73,971	65,742	3,915	26,053
Feb.	71,797	63,103	4,146	26,970
Mar.	75,908	66,517	4,346	27,470
Apr.	66,777	58,453	4,523	27,423
4 mo.	288,453	253,815	17,030	.....



STEEL CASTINGS—SHIPMENTS

(Net tons[1])

	All Castings			Carbon			Alloy			
	Total	For Sale	Railway Specialties	Total	For Sale	Railway Specialties	Total	For Sale	Railway Specialties	Unfilled Orders[2]
1958	1,121,000	856,986	149,644	801,846	606,240	136,251	319,154	250,746	13,393	.....
1959										
Apr.	134,344	104,890	21,372	99,295	76,802	19,761	35,049	28,088	1,611	271,613
4 mo.	481,333	377,434	70,552	348,221	273,054	64,445	129,852	104,376	5,117	.....
May	135,359	105,804	23,825	101,504	78,767	22,498	33,855	27,037	1,327	263,969
June	143,624	111,725	26,567	107,000	82,485	24,568	36,624	29,240	1,999	248,782
July	106,448	83,540	16,007	77,990	60,501	14,520	28,458	23,039	1,487	274,065
Aug.	95,014	79,188	17,607	74,825	60,243	16,373	23,189	18,945	1,234	279,261
Sept.	99,731	79,963	13,975	73,648	58,453	12,830	26,083	21,510	1,145	256,871
Oct.	105,570	84,850	11,819	80,127	63,901	10,978	25,443	20,108	841	268,874
Nov.	109,460	86,026	11,764	77,320	59,294	10,799	29,305	26,732	965	301,858
Dec.	133,346	104,138	18,868	99,643	77,517	17,200	33,703	26,621	1,668	306,346
Total	1,412,885	1,112,668	210,984	1,043,538	814,219	194,201	366,512	298,449	16,783	.....
1960										
Jan.	122,565	94,052	22,016	93,197	70,815	20,891	29,368	23,237	1,125	314,237
Feb.	129,259	97,927	26,532	96,888	72,963	25,328	32,371	24,964	1,204	279,684
Mar.	143,708	109,688	27,801	104,742	78,755	26,365	38,966	30,933	1,436	277,982
Apr.	127,219	96,557	26,101	93,433	70,251	24,526	33,786	26,306	1,575	248,902
4 mo.	522,751	398,224	102,450	388,260	292,784	97,110	134,491	105,440	5,340	.....

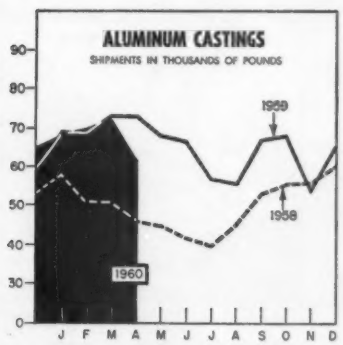
[1]Source: Bureau of the Census. [2]For sale only.

been promoted to assistant general superintendent, Shenango Furnace Co. He is succeeded as foundry superintendent by Paul R. DeSantis, and Lee S. Robertson, formerly general foreman, succeeds the latter as assistant foundry superintendent . . . John Zotos, recently with Watertown Arsenal's Experimental Foundry Branch, has been appointed assistant professor, Northeastern University.

OBITUARY: Walter A. Bergen, assistant to the president, Symington-Gould Co., division of Symington Wayne Corp., died June 30 . . . Eugene H. Bird, 67, president, Eastern Gas & Fuel Associates, Boston, died July 19 . . . Henry T. Chandler, 69, former vice president, Vanadium Corp. of America, died July 19.

FOUNDRY EXPANSION: Wisconsin Centrifugal Foundry Inc., Waukesha, Wis., has begun work on the fourth major expansion to its facilities in the last six years. The current program includes a two-story office building, an 80 per cent increase in the size of the stainless foundry, a 30 per cent increase in the machine shop, locker rooms, and more efficient shipping and receiving. Cost is expected to approach $200,000. In addition, plans are underway for the addition of about 10,000 sq ft to the bronze foundry, probably late in 1960 or early in 1961.

MISCELLANY: The Brass & Bronze Ingot Institute has extended the deadline for entries in its Progress '60 Brass and Bronze Casting Competition to Sept. 30 . . . Thermolyne Corp. is the new name of the former Thermo Electric Mfg. Co., Dubuque, Iowa . . . S. G. Taylor Chain Co., Hammond, Ind., has purchased the Carroll Chain Co. equipment for the manufacture of weldless and stamped chain . . . Sunbeam Equipment Corp., Meadville, Pa., has appointed Matheson-Doherty Co., 225 Shaw Rd., South San Francisco, to represent its line of industrial furnaces and equipment in northern California . . . Production of ingots and steel for castings during the first half of 1960 totaled 60,743,222 tons, in spite of a decline in output during the second quarter. The first-half 1960 figure is the third highest half-year on record . . . In spite of a sharp drop in net new orders for industrial heating equipment during May, total new orders for the first five months of 1960 were up 14.5 per cent.



PRODUCTION WORKERS

Estimated Number

	April 1960	March 1960	April 1959
Ferrous	193.0	194.7	194.3
Nonferrous	51.3	53.7	52.8

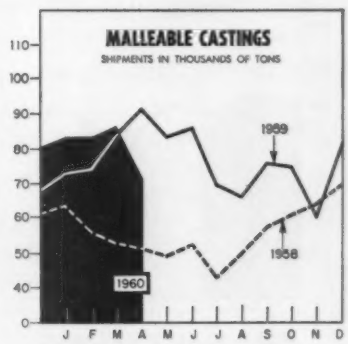
Average Weekly Earnings

Gray Iron	92.72	97.96	96.96
Malleable Iron	91.92	95.63	95.99
Steel	101.27	102.56	103.63
Nonferrous	97.32	100.60	98.88

Average Weekly Hours

Gray Iron	38.0	39.5	40.4
Malleable Iron	38.3	39.7	40.5
Steel	39.1	39.6	40.8
Nonferrous	39.4	40.4	41.2

Source: Bureau of Labor Statistics.



ALUMINUM CASTINGS

(Shipments of castings—1000 pounds[1])

	Shipments Total	Sand	Perm. Mold	Die	Unfilled Orders[2]
1958	641,700	125,487	224,092	290,275	.....
1959					
Apr.	72,976	12,700	26,153	33,992	85,636
4 mo.	283,604	47,152	103,389	132,901	.....
May	68,268	11,979	25,283	30,877	80,325
June	66,479	12,312	24,927	29,092	81,228
July	56,911	11,581	20,410	24,786	80,450
Aug.	55,904	11,130	17,824	26,818	82,488
Sept.	66,193	12,309	21,506	32,239	81,839
Oct.	67,499	12,958	21,781	32,640	78,930
Nov.	54,557	10,813	16,326	27,303	84,392
Dec.	65,069	12,409	20,078	32,463	86,947
Total	784,474	141,503	273,814	371,428	.....
1960					
Jan.	68,247	11,278	22,368	34,514	92,109
Feb.	71,699	11,300	23,614	36,177	83,914
Mar.	72,216	12,934	22,413	36,749	78,024
Apr.	61,797	12,339	20,957	28,393	75,243
4 mo.	273,959	48,351	89,352	135,833	.....

[1]Source: Bureau of the Census. [2]For sale only.

MALLEABLE IRON CASTINGS

(Shipments of castings—net tons[1])

	Shipments Total	For Sale	Standard Total	For Sale	Pearlitic Total	For Sale	Unfilled Orders
1958	660,650	383,839	540,600	313,597	120,050	70,242	.....
1959							
Apr.	90,974	54,306	75,583	43,835	18,391	10,471	102,508
4 mo.	323,255	189,756	257,295	151,465	68,960	48,291	.....
May	83,472	49,619	66,512	40,438	16,960	9,181	99,879
June	85,497	51,411	68,426	42,453	17,071	8,958	95,339
July	69,184	43,128	55,120	35,787	14,064	7,341	75,252
Aug.	65,062	40,143	53,217	33,224	11,845	6,919	85,552
Sept.	76,063	46,469	60,209	36,619	15,854	9,850	82,274
Oct.	75,511	48,625	61,683	40,088	13,828	8,537	85,031
Nov.	58,258	42,235	48,951	33,981	9,307	8,254	82,555
Dec.	80,060	45,917	61,455	35,891	18,605	10,026	93,874
Total	916,362	557,303	729,868	449,946	186,494	107,357	.....
1960							
Jan.	83,188	46,154	63,637	35,933	19,551	10,221	100,302
Feb.	83,118	46,850	64,131	37,391	18,987	9,459	98,272
Mar.	86,243	49,907	67,448	40,422	18,795	9,485	84,679
Apr.	71,271	39,059	56,136	32,056	15,135	6,993	79,237
4 mo.	319,820	181,970	251,352	145,812	72,660	36,158	.....

Prices of Foundry Metals and Coke

(As of July 25, 1960)

FOUNDRY COKE

(Per net ton, f.o.b. ovens)

BEEHIVE

Connellsville	$18.00-$18.50

OVEN

Birmingham	$30.35
Buffalo	32.00
Detroit	32.00
Erie, Pa.	32.00
Indianapolis	31.25
Kearney, N. J.	31.25
Milwaukee	32.00
Neville Island (Pittsburgh)	30.75
New England, deld.	33.55
New Haven, Conn.	31.00
Painesville, O.	32.00
Philadelphia	31.00
St. Louis	33.00
St. Paul	31.25
Swedeland, Pa.	31.00
Terre Haute, Ind.	31.25

PIG IRON

(Per gross ton, f.o.b. furnace)

	No. 2 Foundry	Malleable
Birdsboro, Pa.	$68.50	$69.00
Birmingham	62.50	66.50
Boston, deld.	75.70	76.20
Buffalo	66.50	67.00
Chester, Pa.	Nom.	Nom.
Chicago	66.50	66.50
Cleveland	66.50	66.50
Duluth	66.50	66.50
Erie, Pa.	66.50	66.50
Fontana, Calif.	75.50	....
Geneva, Utah	66.50	....
Granite City, Ill.	68.40	68.90
Neville Island (Pittsburgh)	66.50	66.50
Swedeland, Pa.	68.50	69.00
Toledo, O.	66.50	66.50
Troy, N. Y.	68.50	68.50
Youngstown, O.	....	66.50

NONFERROUS INGOT

(Cents per pound, carlots)

BRASS AND BRONZE: Red brass, No. 115, 29.25; tin bronze, No. 225, 39.50; No. 245, 34.00; high-leaded tin bronze, No. 305, 33.75; No. 1 yellow, No. 405, 23.75; manganese bronze, No. 421, 28.25.

ALUMINUM: 99 per cent plus primary ingots, 28.10. Secondary No. 12 alloy, 23.75-24.25. Deoxidizing grades: No. 1, 25.00; No. 4, 22.25.

MAGNESIUM ALLOY: AZ63A, 37.50; AZ91B, 37.25; AZ91C, 41.25; AZ92A, 37.50.

COPPER: Electrolytic 33.00, delivered Connecticut valley.

ZINC: High grade 14.35, delivered. Die casting alloy No. 3, 16.25; No. 2, 16.75, delivered.

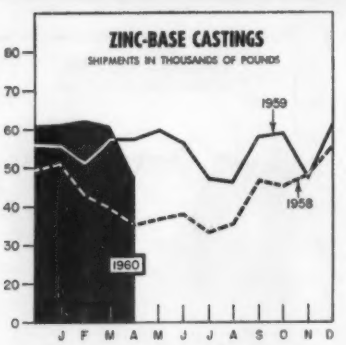
Iron and Steel Scrap

(Consumer prices per gross ton delivered, except as otherwise noted)

	No. 1 Heavy Melting Steel	No. 1 Cupola Cast	Heavy Breakable Cast	Clean Auto Cast	Machinery Cast	Malleable	Short Steel Rails
Birmingham	$27.00-28.00	$46.00-47.00	.....	.....	.....	.....	$45.00-46.00
Boston*	**24.00-24.50	**39.00-40.00	.....	.....	**40.00-42.00	.....	.....
Buffalo	29.00-30.00	**42.00-43.00	.....	.....	**48.00-49.00	.....	49.00-50.00
Chicago	31.00-32.00	40.00-41.00	.....	45.00-46.00	45.00-46.00	44.00-45.00	47.00-49.00
Cincinnati*	**26.50-27.50	**36.00-37.00	**31.00-32.00	.....	**48.00-49.00	.....	**51.00-52.00
Cleveland	31.00-32.00	44.00-45.00	30.00-31.00	50.00-51.00	50.00-51.00	48.00-49.00	50.00-52.00
Detroit*	**25.00-26.00	**36.00-37.00	**30.00-31.00	**43.00-44.00	.....	.....	.....
Los Angeles	32.00	42.00	.....	.....	.....	.....	.....
New York*	31.00-32.00	36.00-37.00	30.00-31.00	.....	.....	.....	.....
Philadelphia	34.00	40.00	38.00	.....	50.00	46.00	.....
Pittsburgh	30.00-31.00	38.00-39.00	.....	37.00-38.00	47.00-48.00	.....	50.00-52.00
St. Louis*	31.00	44.00	35.00	45.00	.....	.....	41.00
San Francisco	34.00	48.00	28.00	40.00	40.00	.....	.....
Seattle	38.50	35.00	34.00	.....	.....	.....	.....

*Brokers' buying prices. **F.o.b. shipping point

Foundry Statistics



ZINC-BASE CASTINGS

(Shipments of castings—1000 pounds[1])

	Shipments—Total	Shipments—For Sale	Unfilled Orders[2]
1958	590,071	409,471	.....
1959			
Apr.	57,325	40,127	55,916
4 mo.	221,732	154,966	.....
May	60,656	43,920	62,224
June	56,128	40,226	54,097
July	46,756	34,606	52,677
Aug.	46,566	34,682	56,090
Sept.	58,144	40,397	60,953
Oct.	59,214	42,594	57,814
Nov.	46,720	37,410	58,076
Dec.	60,606	39,516	65,723
Total	656,520	468,317	.....
1960			
Jan.	61,537	39,777	64,940
Feb.	62,925	42,089	66,945
Mar.	60,816	39,618	60,267
Apr.	47,553	31,423	56,312
4 mo.	232,831	152,907	.....

*Source: U. S. Dept. of Interior, Bureau of Mines. **Source: American Iron & Steel Institute. [1]Monthly figures do not add up to totals shown because of unreported monthly revisions.

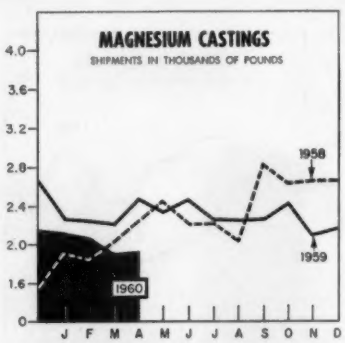
PIG IRON

PRODUCTION**—Net Tons

	Foundry	Malleable & Silvery	Low & Int. Low Phos. & Bessemer
1958	1,622,320	2,448,917	4,954,854
1959			
May	198,126	358,087	474,820
5 mo.	844,065	1,517,044	2,105,883
June	188,158	346,231	441,052
July	166,378	173,760	253,935
Aug.	N.A.	N.A.	N.A.
Sept.	N.A.	N.A.	N.A.
Oct.	N.A.	N.A.	N.A.
Nov.	148,660	180,927	216,063
Dec.	177,017	306,303	452,426
Totals[3]	1,889,445	2,810,359	3,471,683
1960			
Jan.	128,232	325,151	462,667
Feb.	148,238	338,866	471,755
Mar.	126,357	333,182	462,914
April	134,509	258,452	395,875
May	135,825	290,057	356,931
5 mo.	673,161	1,548,430	2,150,142

CONSUMPTION*—Gross Tons

	Cupola	Air	Electric
1958	3,314,652	169,267	231,145
1959			
Feb.	324,576	17,960	37,414
2 mo.	646,178	35,073	74,197
Mar.	353,985	20,625	42,464
Apr.	366,378	21,997	41,597
May	358,192	20,424	40,812
June	366,136	20,390	39,867
July	311,327	16,391	20,437
Aug.	288,547	15,937	4,923
Sept.	336,015	18,057	6,033
Oct.	351,679	20,011	5,749
Nov.	276,168	16,350	28,231
Dec.	334,524	18,613	47,045
Total	3,989,129	223,868	351,355
1960			
Jan.	328,242	18,634	45,936
Feb.	322,945	19,257	42,883
2 mo.	651,187	37,891	88,819



MAGNESIUM CASTINGS

(Shipments of castings—1000 pounds[1])

	Shipments—Total	Shipments—For Sale	Unfilled Orders[2]
1958	28,776	25,024	.....
1959			
Apr.	2,455	2,213	4,787
4 mo.	9,124	8,218	.....
May	2,370	2,093	5,102
June	2,484	3,207	4,664
July	2,265	1,875	3,995
Aug.	2,243	1,753	3,809
Sept.	2,263	1,832	3,823
Oct.	2,436	1,890	3,501
Nov.	2,023	1,628	3,281
Dec.	2,163	1,731	3,423
Total	27,371	24,227	.....
1960			
Jan.	2,135	1,588	3,209
Feb.	2,075	1,679	3,278
Mar.	1,903	1,524	3,208
Apr.	1,926	1,533	3,138
4 mo.	7,039	6,324	.....

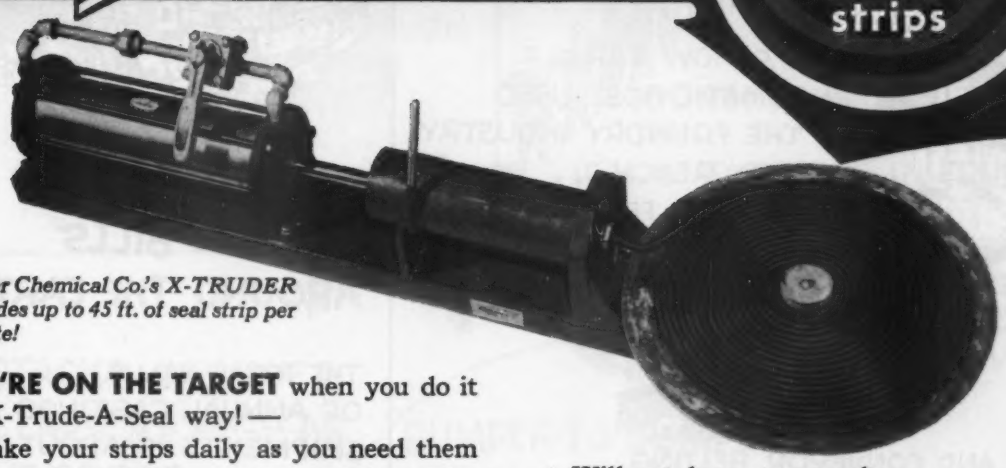
[1]Source: Bureau of the Census. [2]For sale.

DO IT YOURSELF

WHITEHEAD'S

X-TRUDE-A-SEAL

Costs less than any packaged preformed strips



Stoller Chemical Co.'s X-TRUDER extrudes up to 45 ft. of seal strip per minute!

YOU'RE ON THE TARGET when you do it the X-Trude-A-Seal way! —

- Make your strips daily as you need them
- Re-extrude all leftovers the next day to desired sizes
- Sizes from ¼" to ¾" diameter

- Will not dry out or crack
- Economical — eliminates waste of material
- Applies faster than preformed extruded strips
- Reduces chipping, grinding, porous metal, leakers
- Eliminates uneven casting walls, excessive fins

Of course, Joint Seal is available for hand rolling, hand gun, or use with Stoller X-Truder

***FIND OUT HOW MUCH YOU CAN SAVE** — contact your distributor . . . or write direct*

Whitehead Brothers COMPANY

Established 1841

NEW YORK OFFICE
324 West 23rd St., New York 11, N. Y.

NEW ENGLAND OFFICE
75 Westminster St., Providence 1, R. I.

Manufacturers of

LYQUAGRIP
Ready-to-use core paste

DUO RESIN
Binder for baking with controlled oven temperatures

JOINT SEAL
Plastic compound for perfect sealing

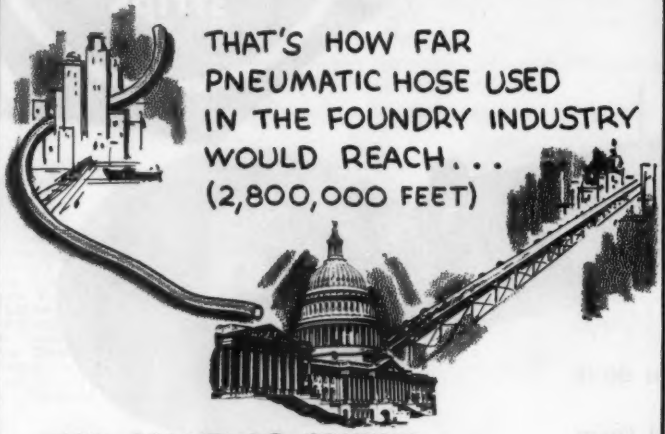
LYQUAFACE
The liquid sand grain coating

DOB-IT
Ready-to-use core mudding compound

Circle 578 on Page 45

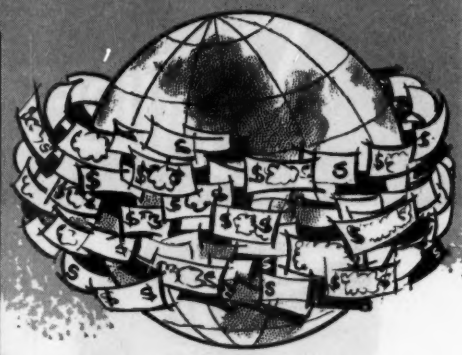
Foundry Facts!

PNEUMATIC HOSE FROM THE WINDY CITY TO THE NATION'S CAPITOL!



THAT'S HOW FAR PNEUMATIC HOSE USED IN THE FOUNDRY INDUSTRY WOULD REACH... (2,800,000 FEET)

...AND CONVEYOR BELTING USED IN FOUNDRIES WOULD EXTEND FROM WASHINGTON, D.C. TO PHILADELPHIA! (1,000,000 FEET)



30 ROWS OF DOLLAR BILLS AROUND THE EARTH!

THE TOTAL VALUE OF ANNUAL CASTINGS SHIPMENTS IS ABOUT **$6,500,000,000**

...AND PROBABLY WILL ACCOMPANY THE FIRST SPACEMAN. 14 WENT INTO THE ROCKET WHICH LAUNCHED THE **FIRST** U.S. SATELLITE...

LIKE COMPARING A 5-FOOT DORY TO THE QUEEN MARY!

SHELL MOLDING AND CORE MAKING RESIN SALES ARE ESTIMATED TO HAVE INCREASED FROM 250,000 POUNDS IN 1950 TO APPROXIMATELY **20,000,000** POUNDS IN 1959.

STARTED IN 1900... DURING THE McKINLEY ADMINISTRATION

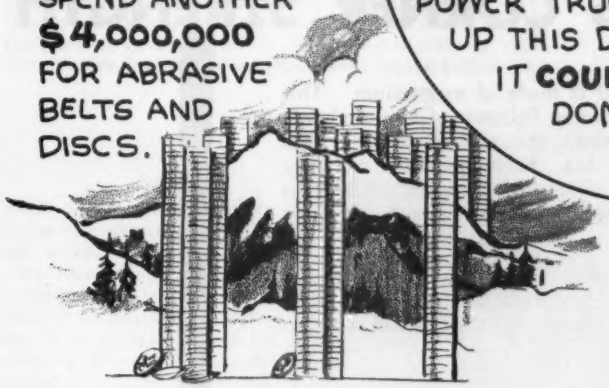
PENTON'S FOUNDRY LIST HAS BEEN ISSUED EVERY OTHER YEAR DOWN THROUGH THE TERMS OF 10 DIFFERENT PRESIDENTS... STILL UNDUPLICATED, STILL UNIQUE!

A HUMAN CHAIN 90 MILES LONG!

THAT'S WHAT YOU WOULD HAVE IF ALL **75,000** OF **FOUNDRY'S** KNOWN READERS WERE TO JOIN HANDS... IF YOU ADVERTISE IN **FOUNDRY** YOU ARE TALKING TO THE KEY BUYING INFLUENCES IN PLANTS REPRESENTING **98%** OF INDUSTRY'S MELTING CAPACITY...

15 STACKS OF SILVER DOLLARS AS HIGH AS MT. EVEREST

FOUNDRIES SPEND **$31,000,000** ANNUALLY FOR GRINDING WHEELS. THEY SPEND ANOTHER **$4,000,000** FOR ABRASIVE BELTS AND DISCS.



BUMPER-TO-BUMPER CONVOY 26 MILES LONG!

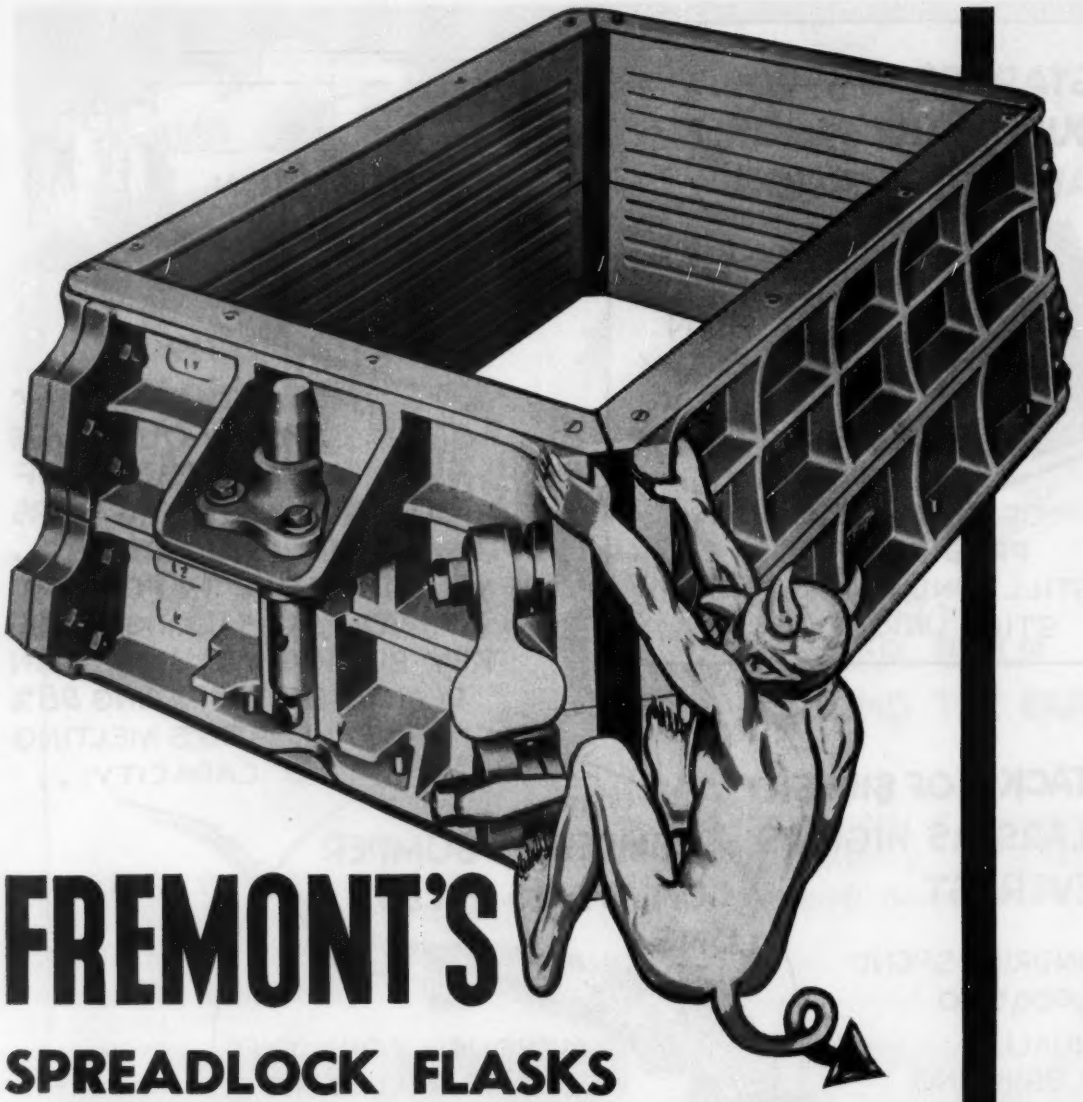
ALTHOUGH FOUNDRIES WOULD BE RELUCTANT TO GIVE UP THEIR POWER TRUCKS TO CONJURE UP THIS DRAMATIC SIGHT, IT **COULD** BE DONE!

BUSINESS MAGAZINE OF THE $6½ BILLION METAL CASTING INDUSTRIES

FOUNDRY

NBP BPA

A PENTON PUBLICATION / PENTON BUILDING • CLEVELAND 13, OHIO



FREMONT'S

SPREADLOCK FLASKS

HAVE TREMENDOUS CORNER STRENGTH

The flask itself is made of magnesium. This gives it strength and lightness. Cams are hardened steel forgings; this assures extra strength where it is needed. Locks, pins and cams are accurately machined; this provides a flask that can be used over and over again for exacting work.

The new FREMONT FLECKS-O JACKET has been developed particularly to eliminate shifts and runouts. Ask us about prices and delivery.

The Fremont Flask Co., Fremont, O.

Circle 579 on Page 45

From a laboratory furnace to a reverberatory furnace Hevi-Duty helps you find the value solution to your non-ferrous melting problems

Hevi-Duty's value solutions to three melting problems are described below. Such solutions call for comprehensive industrial engineering ability as proved by Hevi-Duty's success in solving thousands of heat processing problems in all types of applications.

Such solutions call for creative design engineering ability backed by Hevi-Duty's experience with industry's most complete line of electric and fuel-fired furnaces and ovens. (Where stock designs or adaptations won't do, Hevi-Duty custom-engineers equipment including huge field-erected furnaces.)

Such solutions call for soundly built and tested equipment typified by Hevi-Duty furnaces now paying off throughout industry in increased production and extended economic life of equipment.

Case histories by the hundreds testify that it makes profitable sense to call in your Hevi-Duty sales engineer to help find the value solution to your melting problems.

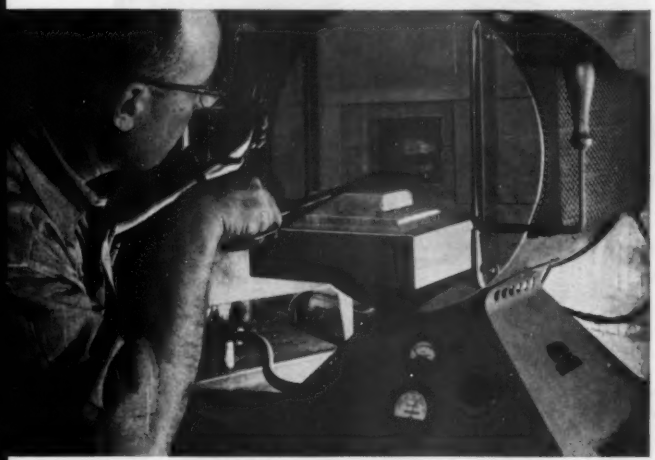
HEVI-DUTY

Electric and Fuel-Fired Industrial Furnaces and Ovens

B P C

A Division of Basic Products Corporation

Hevi-Duty Electric Company, Milwaukee 1, Wis.



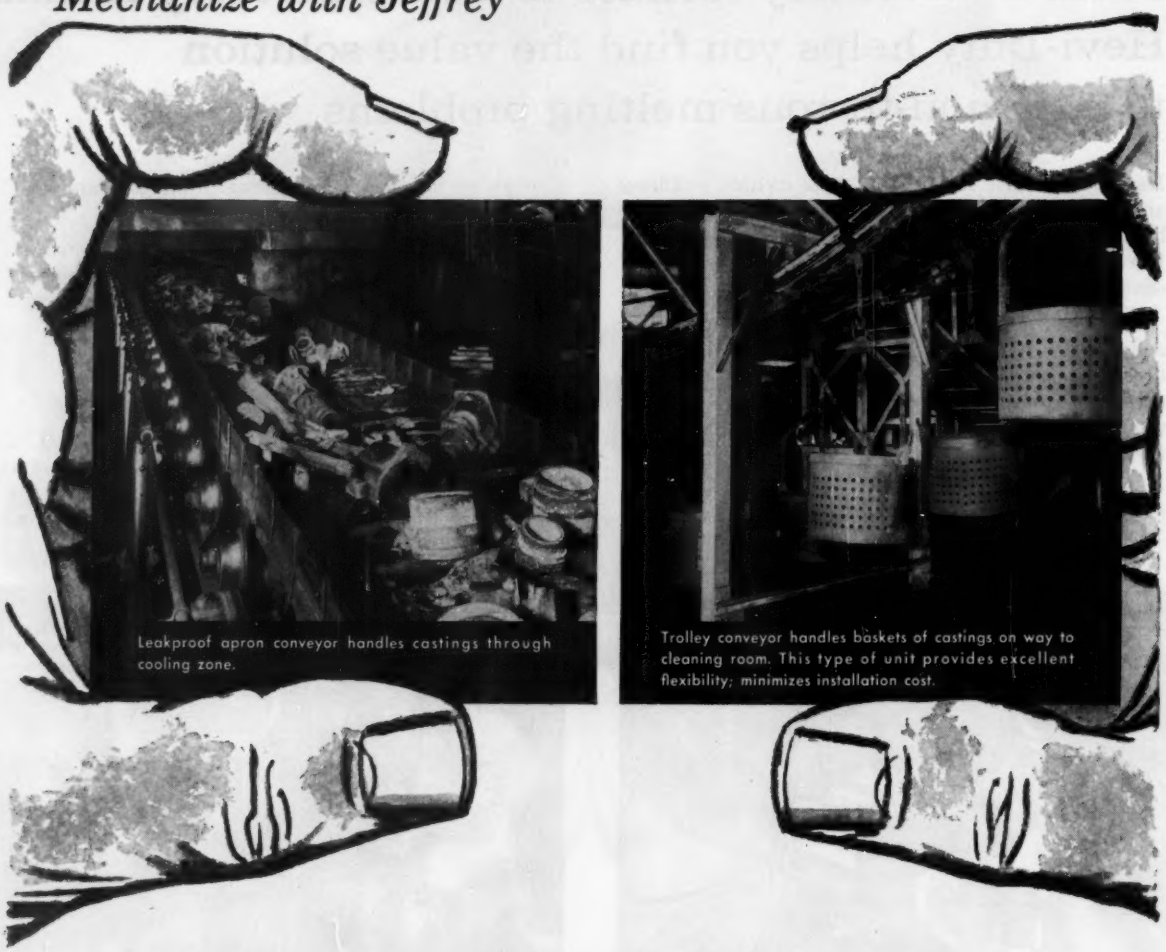
Hevi-Duty G-05 laboratory furnace used by Great Lakes Steel Corp., Detroit, for determining alumina content of slag is kept at 2200°F, 24 hours a day, 7 days a week. It heats rapidly, has 48 steps of control between 1700°F and 2600°F. Instruments and controls in base remain close to room temperature. **For more information please request Bulletin 254.**

Double-chamber dry-hearth aluminum melting furnace covers only 32 sq. ft. area at In-Sink-Erator Co., Racine, Wis., yet melts and holds up to 400 pounds of aluminum per hour after 2½-hour warm up. Well insulated furnace permits use of a permanent mold machine next to the dip-out chamber. **For complete information write for Bulletin 593.**

Each of these reverberatory furnaces melt and hold 35,000 lbs. of aluminum for direct-chill billet casting. One furnace brings melt up to temperature while other pours. Large doors permit easy bath access for charging, drossing, fluxing, alloying and furnace cleaning. **Please write for Bulletin 591.**

Circle 580 on Page 45

Mechanize with Jeffrey



Leakproof apron conveyor handles castings through cooling zone.

Trolley conveyor handles baskets of castings on way to cleaning room. This type of unit provides excellent flexibility; minimizes installation cost.

MECHANIZED CONVEYING OF CASTINGS CUTS YOUR COSTS

Rugged conveyors—apron, pendant (trolley), or vibrating—move castings efficiently and quickly from shakeout, through cooling zone, to cleaning room. Speeds can be selected for ample cooling time—for chipping and sorting en route.

Starting with basic requirements, Jeffrey Foundry Engineers will help you select just the right conveying equipment for castings... will erect the installation (if desired), and stay on the job until everything is in top-notch working order.

Other foundry operations are important, and Jeffrey builds for them too. Consult our Foundry Engineers for cost-cutting ideas in Sand Handling and Conditioning, Mold Preparation, Castings Handling or for special unit machines. Catalog No. 911 tells all—write, The Jeffrey Manufacturing Company, 907 N. Fourth St., Columbus 16, Ohio.

JEFFREY

CONVEYING • PROCESSING • MINING EQUIPMENT...TRANSMISSION MACHINERY...CONTRACT MANUFACTURING

Circle 581 on Page 45

Reduces chill...

Vancoram V-5 Foundry Alloy Reduced chill (without formation of open structures in heavier sections) is just one of the benefits of this special chromium alloy balanced with manganese and silicon. Vancoram V-5 improves the mechanical properties, density and uniformity of irons...and it eliminates chilled corners and edges, for best machinability. Better castings at lower cost! Another important benefit is this: by varying the V-5 addition between ¼% and 1½%, a single iron can be adapted to serve in a wide range of section sizes. Write for your copy of an informative V-5 Foundry Alloy folder or call your nearest VCA District Office. Vanadium Corporation of America, 420 Lexington Avenue, New York 17, N. Y. · Chicago · Cleveland · Detroit · Pittsburgh.

Vancoram Products are also distributed by: Pacific Metals Co., Ltd. · Steel Sales Corporation · J. M. Tull Metal and Supply Co., Inc. · Whitehead Metals, Inc. · Williams and Company, Inc.

VANADIUM
CORPORATION OF AMERICA
Producers of alloys, metals and chemicals

VANCORAM

Circle 582 on Page 45

News about

B.F.Goodrich Chemical *raw materials*

Photo shows finishing operations on large dry-sand mold for precision casting at Solon Industries, Inc., Solon, Ohio.

SOLON INDUSTRIES, INC. REPORTS:

New Good-rite CB-40 improves casting quality, reduces scrap

Here's what Solon Foundry, Subsidiary of Solon Industries, Inc., Solon, Ohio, has to say about the use of Good-rite CB-40, the new low-gassing mold and core binder designed for light metal precision casting:

Low-gassing: At Solon, the exceptionally small amounts of gas produced by Good-rite CB-40 mean that blow holes are practically eliminated. At the same time, since scrap is considerably reduced, savings are sizeable.

Finer finishes: Good-rite CB-40 permits the use of finer sands to produce exceptionally smooth finishes and eliminate machining operations. Tolerances are closer, too, since it is possible to cast far more accurately than with other core binders.

Other advantages: Good-rite CB-40 provides dimensional stability, excellent collapsibility and shakeout, and more efficient baking—no critical oven control needed. It can be used with any present method and is safe at all stages—will not burn, releases no objectionable fumes.

You can get more information about Good-rite CB-40 by writing Dept. JE-4, B.F.Goodrich Chemical Company, 3135 Euclid Avenue, Cleveland 15, Ohio. Cable address: Goodchemco. In Canada: Kitchener, Ontario.

Good-rite CHEMICALS

B.F.Goodrich Chemical Company
a division of The B.F.Goodrich Company

B.F.Goodrich

GEON vinyls • HYCAR rubber and latex • GOOD-RITE chemicals and plasticizers

Circle 583 on Page 45

Use These Cards . . .

FOUNDRY

- For more information on anything advertised in this issue
- For further data on products described in the Equipment and Supplies section (Page 85)
- To get copies of publications listed in the Literature for Foundrymen section (Page 165)
- To request extra copies of editorial articles

FOUNDRY AUGUST 1960

401	431	461	491	521	551	581	611	641	671	701	731	761	791	821	851
402	432	462	492	522	552	582	612	642	672	702	732	762	792	822	852
403	433	463	493	523	553	583	613	643	673	703	733	763	793	823	853
404	434	464	494	524	554	584	614	644	674	704	734	764	794	824	854
405	435	465	495	525	555	585	615	645	675	705	735	765	795	825	855
406	436	466	496	526	556	586	616	646	676	706	736	766	796	826	856
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408	438	468	498	528	558	588	618	648	678	708	738	768	798	828	858
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411	441	471	501	531	561	591	621	651	681	711	741	771	801	831	861
412	442	472	502	532	562	592	622	652	682	712	742	772	802	832	862
413	443	473	503	533	563	593	623	653	683	713	743	773	803	833	863
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416	446	476	506	536	566	596	626	656	686	716	746	776	806	836	866
417	447	477	507	537	567	597	627	657	687	717	747	777	807	837	867
418	448	478	508	538	568	598	628	658	688	718	748	778	808	838	868
419	449	479	509	539	569	599	629	659	689	719	749	779	809	839	869
420	450	480	510	540	570	600	630	660	690	720	750	780	810	840	870
421	451	481	511	541	571	601	631	661	691	721	751	781	811	841	871
422	452	482	512	542	572	602	632	662	692	722	752	782	812	842	872
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426	456	486	516	546	576	606	636	666	696	726	756	786	816	846	876
427	457	487	517	547	577	607	637	667	697	727	757	787	817	847	877
428	458	488	518	548	578	608	638	668	698	728	758	788	818	848	878
429	459	489	519	549	579	609	639	669	699	729	759	789	819	849	879
430	460	490	520	550	580	610	640	670	700	730	760	790	820	850	880

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COMPANY _____

PRODUCT MANUFACTURED _____

ADDRESS _____

CITY _____ ZONE_____

STATE _____

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401	431	461	491	521	551	581	611	641	671	701	731	761	791	821	851
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407	437	467	497	527	557	587	617	647	677	707	737	767	797	827	857
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411	441	471	501	531	561	591	621	651	681	711	741	771	801	831	861
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416	446	476	506	536	566	596	626	656	686	716	746	776	806	836	866
417	447	477	507	537	567	597	627	657	687	717	747	777	807	837	867
418	448	478	508	538	568	598	628	658	688	718	748	778	808	838	868
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425	455	485	515	545	575	605	635	665	695	725	755	785	815	845	875
426	456	486	516	546	576	606	636	666	696	726	756	786	816	846	876
427	457	487	517	547	577	607	637	667	697	727	757	787	817	847	877
428	458	488	518	548	578	608	638	668	698	728	758	788	818	848	878
429	459	489	519	549	579	609	639	669	699	729	759	789	819	849	879
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COMPANY _____

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FOUNDRY

Reader Information Service

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FIRST CLASS
Permit No. 36
CLEVELAND, OHIO

BUSINESS REPLY MAIL
No Postage Stamp Necessary if Mailed in the United States
—POSTAGE WILL BE PAID BY—

FOUNDRY
Penton Building
Cleveland 13, Ohio

Reader's Service Dept.

FIRST CLASS
Permit No. 36
CLEVELAND, OHIO

BUSINESS REPLY MAIL
No Postage Stamp Necessary if Mailed in the United States
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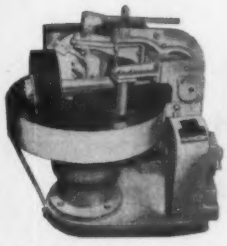
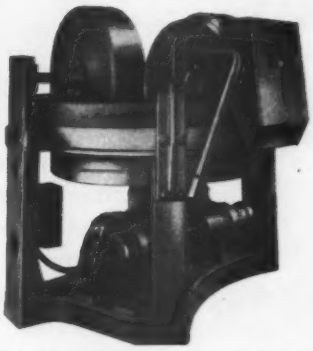
FOUNDRY
Penton Building
Cleveland 13, Ohio

Reader's Service Dept.

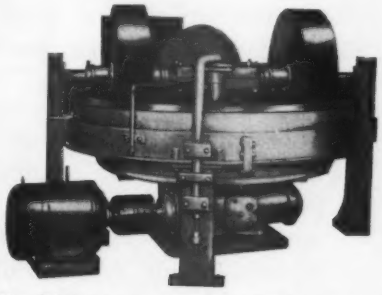


No. 251 2½-ft. diameter
. . . . ½ to 1 cu. ft. batch

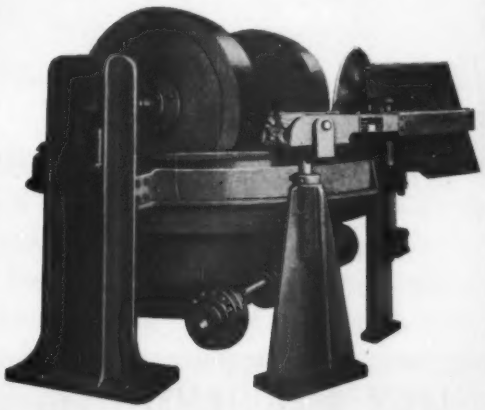
No. 414 4-ft. diameter
. . . . . 2 to 4 cu. ft. batch



No. 610 6-ft. diameter. . . . 10 to 14 cu. ft. batch



No. 715 7-ft. diameter. . . . 15 to 20 cu. ft. batch



No. 930 9-ft. diameter. . . . 30 to 40 cu. ft. batch

ANY SIZE MADE TO YOUR SPECIFICATIONS

From compact portables to heavy-duty mullers

CLEARFIELD CAN SUPPLY THE RIGHT MIXER FOR YOUR JOB

Clearfield Mixers are available in capacities ranging from ½ to 40 cu. ft. . . . for batch or continuous mixing. They're constructed of rugged cast iron for strength, rigidity and wear resistance. And all Clearfield mixers feature the "revolving pan" mixing principle which keeps the material in *constant* state of violent motion; this eliminates the "lag" intervals which result in mixers with mullers and scrapers that revolve instead of the pan. With Clearfield revolving-pan mixers you get a constant controlled-course mixing action which assures a better balance of blending and tempering.

Whether you need a mixer for maintaining proper bond and moisture in heap sands . . . preparing facing sand or core sand for castings . . . or for any foundry application where sand control is important . . . Clearfield Mixers can do the job better, and save you production money.

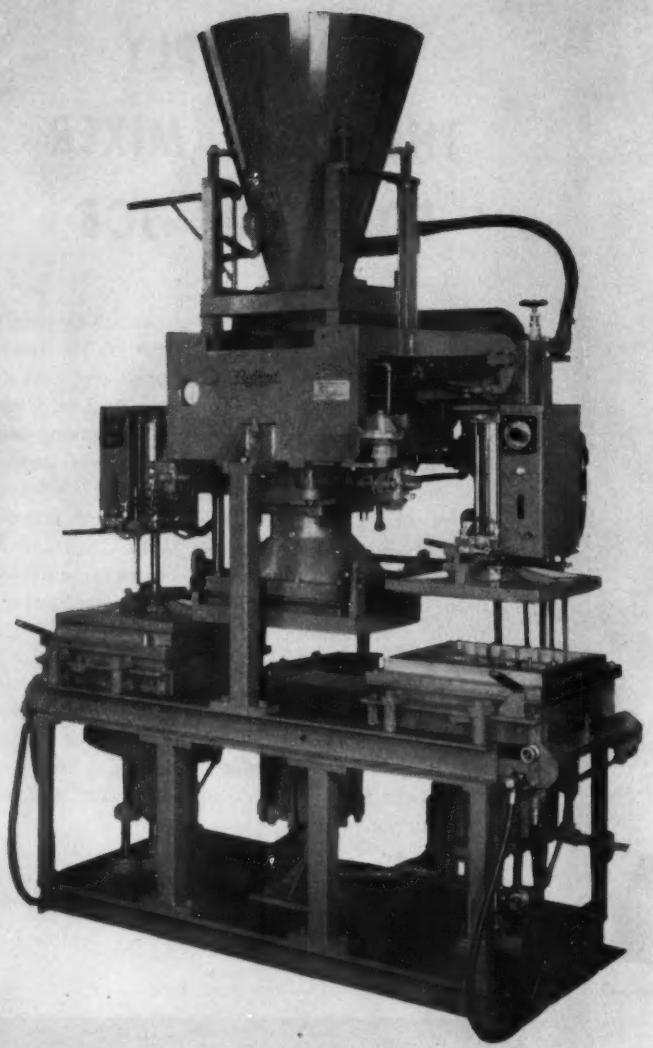
Let us help you determine the best type and size for your particular needs. No obligation. Meanwhile, send for Catalog No. 90.

CLEARFIELD
MACHINE COMPANY
CLEARFIELD, PENNSYLVANIA, U.S.A.

Circle 584 on Page 45

Redford

MODEL NO. D-5-H CO_2 MOLD MAKING MACHINE



A proven CO_2 Molding Machine that combines one blow and squeeze and two gassing and stripping stations into one unit for easier handling of mold patterns. Patterns are mounted on carriages which are moved manually from blowing to gassing position. Squeeze plate travel is air operated. The squeeze operation is used to increase mold density and produce perfectly flat molds that can be stacked for pouring.

Electrical reset timers control the automatic gassing and stripping cycle. Maximum standard mold size is 12 x 14 in. and thickness of half molds may vary from ¾ to 2½ in. Up to 90 complete molds-cope and drag-per hour are produced by one operator.

For further information regarding standard Redford CO_2 Mold Making Equipment write for Bulletin 421.

REDFORD

IRON & EQUIPMENT CO.

20733 Glendale - Detroit 23, Mich.

Phone: KEnwood 1-8611

PRINTED IN U. S. A.

Circle 585 on Page 45

PLANNED MASS-HANDLING

Your immediate attack against rising costs

YOU NEEDN'T WAIT TO SEE RESULTS! Towmotor fork trucks have the power and capacity to make your savings a matter of record—from the very first day of operation. You get noticeable advantages in Towmotor engineering—in new features that enable the Towmotor "one-man-gang" to get more work done at much lower cost. Write for case studies that show you how companies similar to yours are reducing costs through more effective handling operations. TOWMOTOR CORPORATION, CLEVELAND 10, OHIO.

RENT or LEASE

your Towmotor-Gerlinger equipment. Increase profits without tying up working capital. For information contact Towmotor-Gerlinger Rental Division, Towmotor Corporation.

FORK LIFT TRUCKS, CARRIERS AND TRACTORS SINCE 1919

TOWMOTOR® -GERLINGER

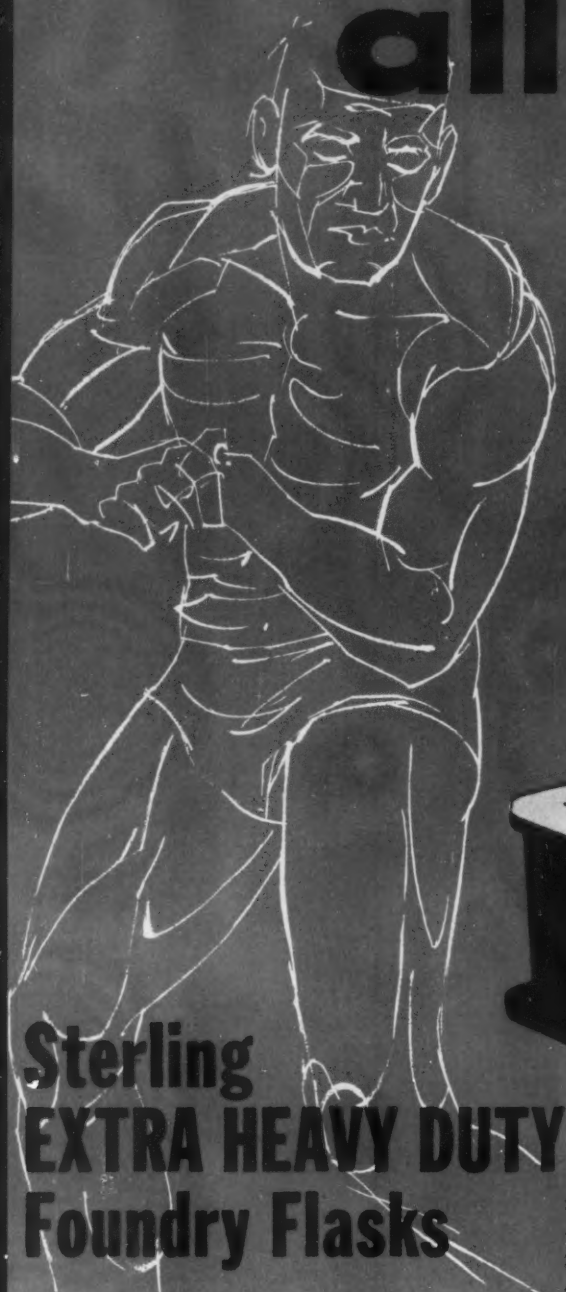
THE ONE-MAN-GANG

Circle 586 on Page 45

Gerlinger Carrier Co. is a subsidiary of Towmotor Corporation

all muscle

...where it counts most



Sterling EXTRA HEAVY DUTY Foundry Flasks

OTHER HIGHLIGHTS OF THIS DESIGN

- Individually Engineered
- Flanges and Reinforcing Members Automatically Welded to Channel Walls
- Precision-Machined Surfaces
- Heavier Walls — Heavier Solid Reinforcing
- All Fittings Jig Welded
- Accurately-Installed Pins and Bushings

Beefier flange construction — broader mating surfaces, more refinishing stock — for every thickness of channel web, makes Sterling Extra Heavy Duty flasks outstanding performers on any foundry floor.

One among many Sterling design superiorities, this feature gives extra assurance of bed-rock dependability throughout a longer production life — particularly where service conditions and customer requirements are severe. Profit-building benefits include: positive match — minimized deformation — higher resistance to ramming shock and machine stress — improved stability under sharply rising heat and pressure of large-metal-volume pourings.

Whatever your flask needs, you find there is no substitute for Sterling's unsurpassed leadership in engineering — uncompromising quality in construction.

AO-4540

Circle 587 on Page 45

STERLING NATIONAL INDUSTRIES, INC.
Founded in 1904 as Sterling Wheelbarrow Co.
Milwaukee 14, Wisconsin, U.S.A.

Associate: STERLING FOUNDRY SPECIALTIES LTD.
LONDON • BEDFORD • JARROW-on-TYNE, ENGLAND

Sterling
WORLD WIDE SERVICE

FOUNDRY
AUGUST 1960

Formula for Success

Intensified activity in research and scientific developments since World War II emphasizes how much we have yet to learn about many subjects.

Years ago it was seriously proposed that the U. S. Patent Office be dispensed with because nothing remained to be invented. Not so today. Now we recognize that new inventions will continue to appear indefinitely and that much basic research will be needed to furnish the answers to important questions about materials, medicine, chemistry, and physics.

For instance, lack of suitable materials is preventing the more rapid development of the nation's weapons, atomic energy, and space programs. This fact was pointed up recently when the government's Advanced Research Projects Agency announced the selection of three universities as sites for multimillion-dollar fundamental research centers. The aim is to add to our basic knowledge of the strength and behavior of materials.

In general, this same situation prevails in the foundry industry. Recent years have seen many important developments—new molding and coremaking materials, a scientific approach to gating and risering, improved nondestructive testing, better quality control, and more efficient equipment, to name only a few. But the world's best foundryman would be the first to admit that we have only a few of the answers.

What complicates the foundry's drive toward better castings is the combination of the many casting variables and the great influence each of these variables exerts on product quality. A case in point is the effect of variations in molding sand moisture on those properties which can cause casting defects. How great this effect can be is well documented by J. S. Schumacher in his article starting on Page 70 of this issue.

It's obvious that the more the foundryman knows about the basic priciples underlying the behavior of the materials with which he works, the better his chances are of producing high-quality castings. It's equally true that if every foundry applied all of the fundamental knowledge already available, considerably fewer castings would be rejected by the inspector.

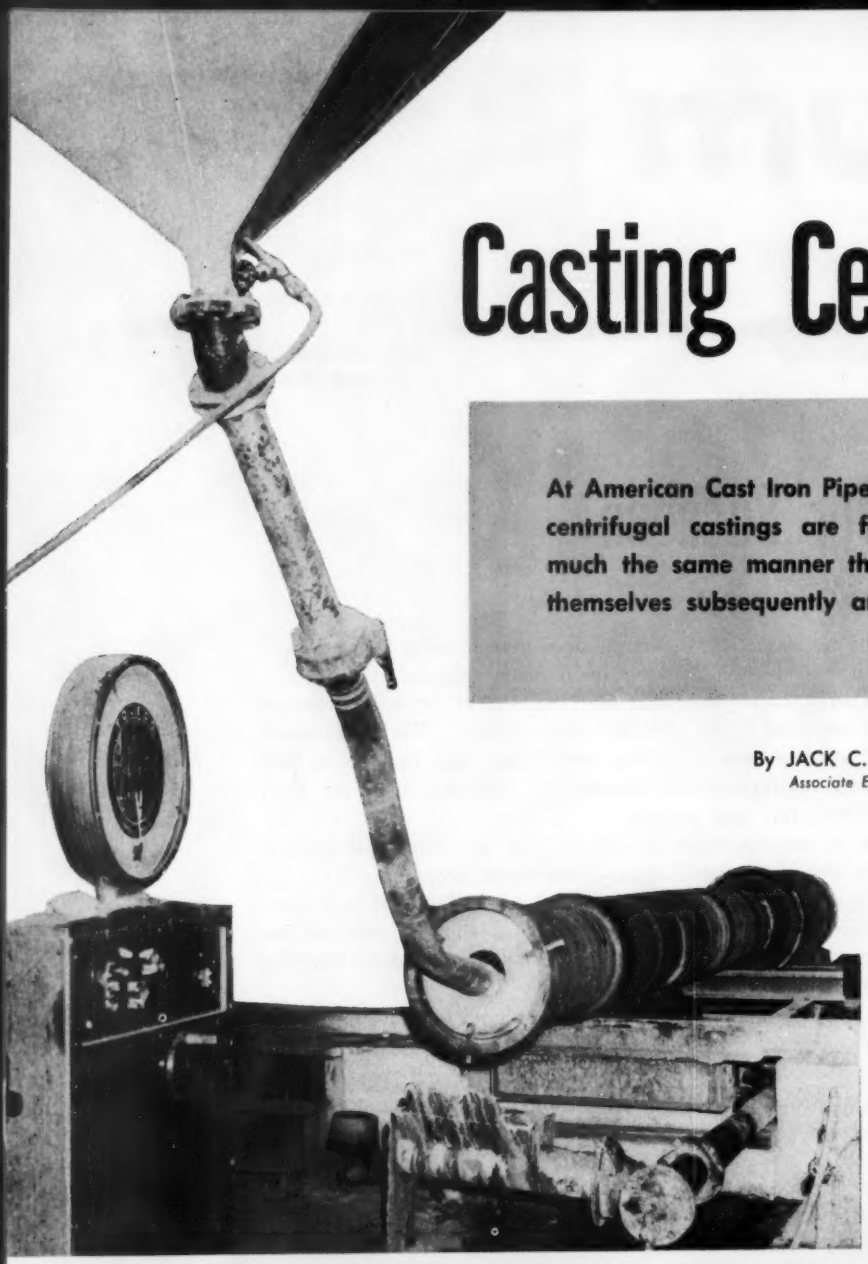
We need to know, but the knowledge is useless unless it's applied. To reduce it to a formula, success equals knowing plus doing.

William G. Reese
Editor

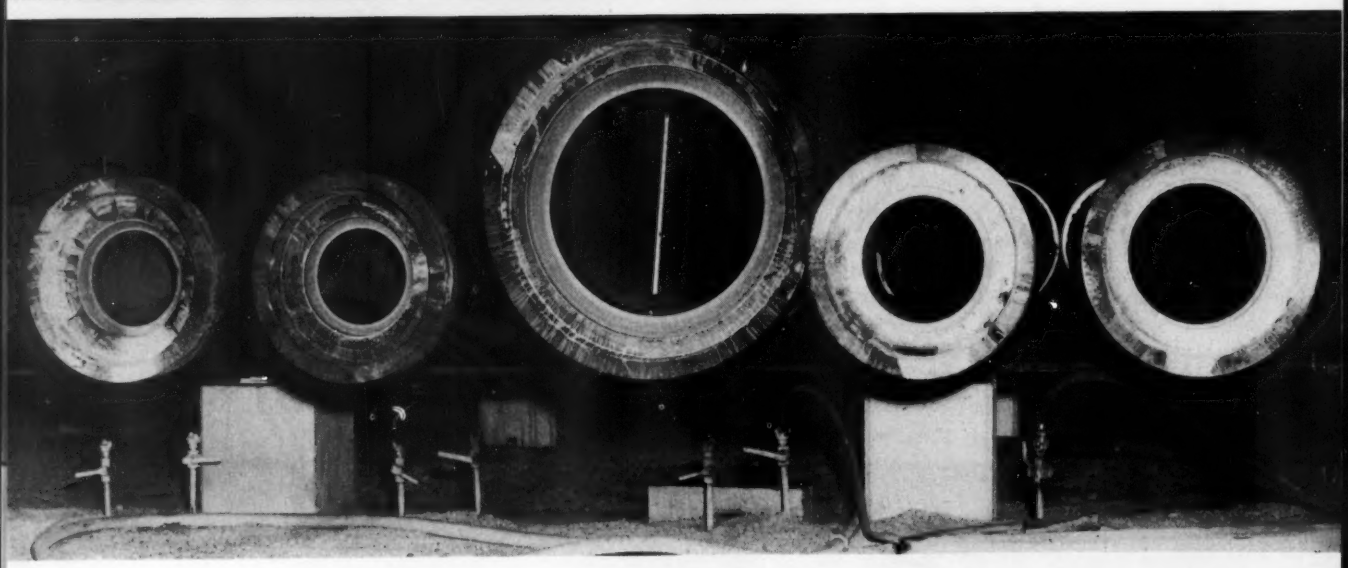
Casting Centrifugally

At American Cast Iron Pipe Co., ceramic molds for centrifugal castings are formed centrifugally in much the same manner that the tubular castings themselves subsequently are formed

By JACK C. MISKE
Associate Editor



Depositing semi-liquid refractory in cylindrical steel flask 20 ft long. Amount introduced determines the mold thickness



Flasks with green centrifugally formed molds which are oven baked to produce dense, hard ceramic molds of predetermined thickness within metal flasks

in Ceramic Molds

● MANY TUBULAR CASTINGS in steel, iron, and high-alloy compositions are produced by centrifugal casting in cylindrical molds, which commonly are of two types: 1. Metal molds with a refractory facing. 2. Sand molds rammed around a cylindrical pattern inside a metal flask.

American Cast Iron Pipe Co. believes that the most logical method of producing a cylindrical mold is to form the mold centrifugally in much the same manner that the tubular casting subsequently is formed centrifugally.

To form refractory mold material centrifugally inside a metal flask, the material should be readily flowable, preferably in the form of a semi-liquid or slurry. A predetermined amount of the semi-liquid refractory is poured inside a cylindrical metal flask, and the amount introduced governs the thickness of the final ceramic mold.

To attain uniform longitudinal distribution of the refractory, the metal flask must be horizontal and level. Distribution can be assisted by slow rotation of the mold at this stage to produce a wallowing motion of the soupy refractory.

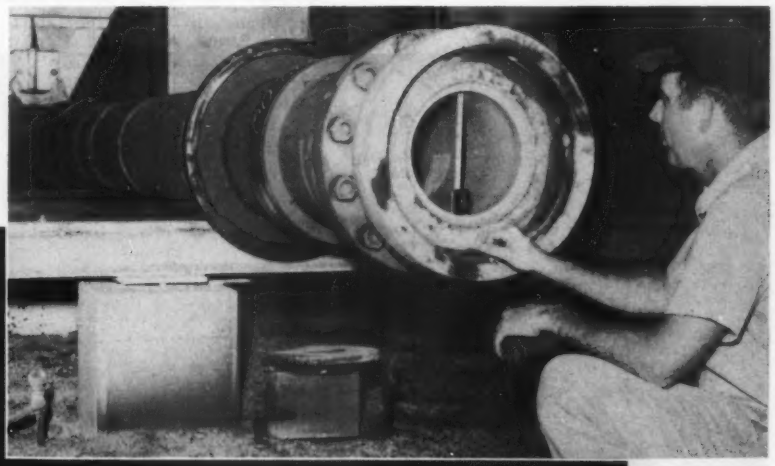
Once a uniform longitudinal distribution has been achieved, rotation of the mold is increased sharply so that the refractory forms a uniform lining on the inner surface of the flask. The high centrifugal force squeezes out most of the water and produces a uniformly dense refractory mold, concentric with the flask spinning bands.

After the spinning, excess water can be drained from the inside of the mold. The green mold then is oven baked to produce a dense, hard ceramic mold of predetermined thickness within the metal flask.

The properties of molds produced by this method, which is covered by a patent application, are in many ways ideally suited to the production of high-quality tubing in steel and other metals. Advantages of this method of forming molds include the following:

1. Assured concentricity of the mold surfaces within the flask.
2. Stepless variation of diameters

Worker checks inside diameter of a centrifugally formed mold ▶



Flask is spun at high speed to compact the mold lining. After the spinning, excess water can be drained from inside of mold

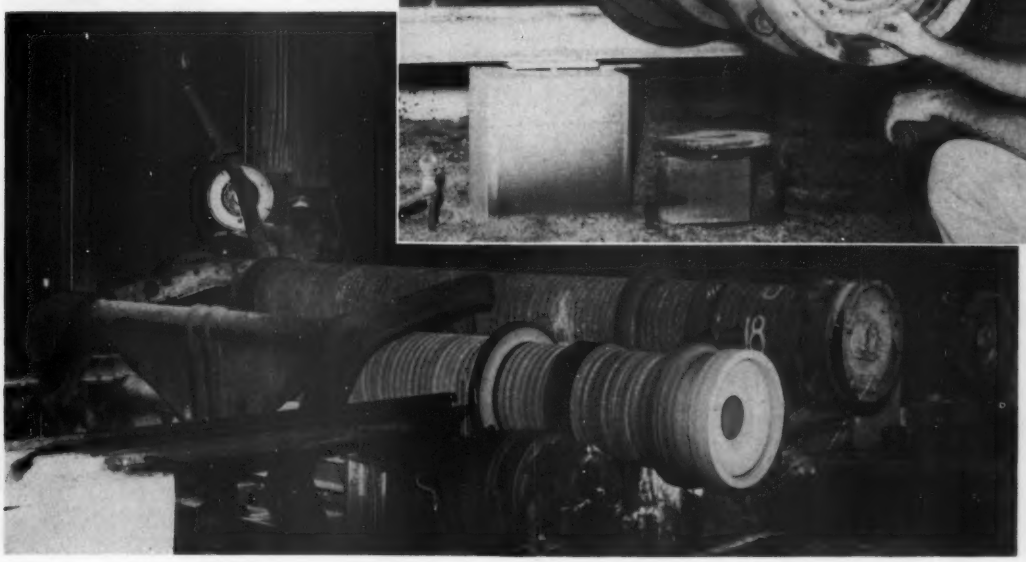


Illustration shows the process of draining excess water from inside compacted mold. This step prepares mold for oven drying and baking

possible in infinite increments.

3. Harder, denser, more uniform refractory molds than can be produced by ramming.

4. Elimination of hot tearing and cracking in the castings because of the reinforcing effect of the ceramic mold.

Producing the Green Mold—At the Acipco's Special Products Div. foundry, tubular products are produced as centrifugal castings 2 to 50 in. in diam and in lengths to 20 ft. Steel flasks currently are available for 4 to 25-in. diam castings 20 ft long and for the larger diameters in 16-ft lengths.

In a typical mold production, the vented flask 20 ft long is placed in the spinning machine for mold forming. Suitable stop-off rings are affixed inside each end of the cylindrical flask. A weighed amount of refractory slurry is introduced into the flask and longitudinally distributed as described previously.

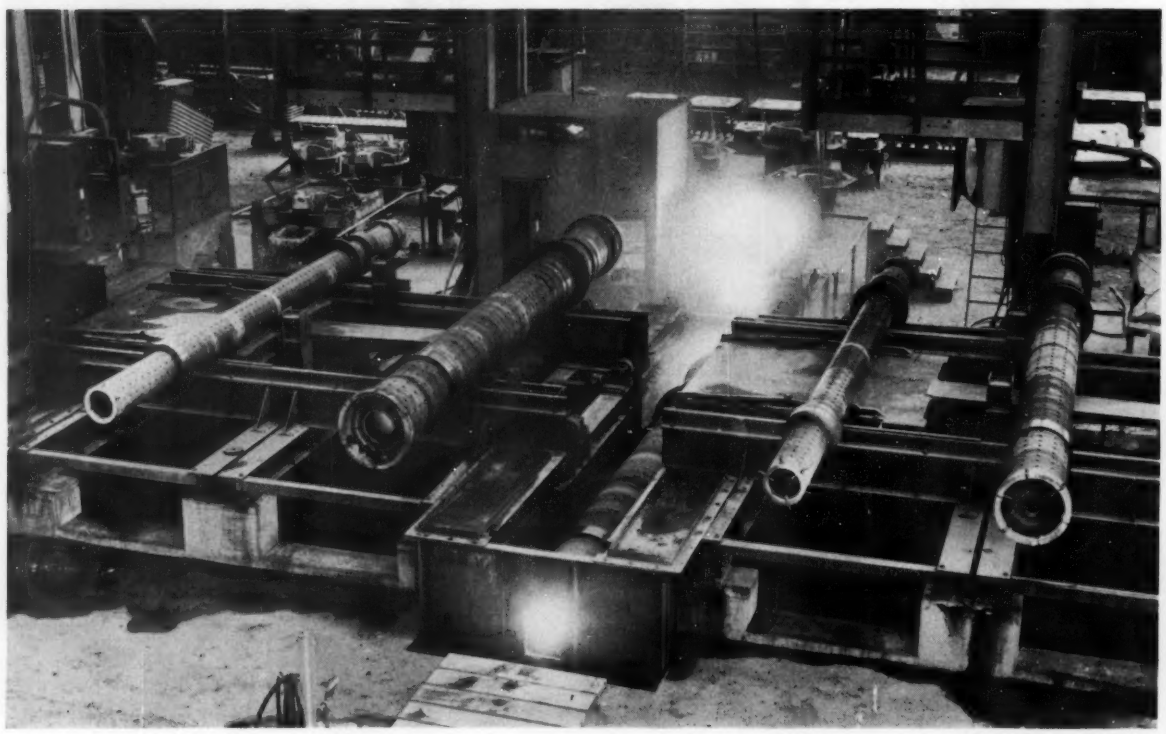
The semi-liquid refractory mix consists of at least four ingredients: 1. A relatively coarse solid refractory which may include a range of grain sizes. 2. A fine solid refractory flour. 3. A suspending or gelling agent to hold the solids in suspension. 4. Water.

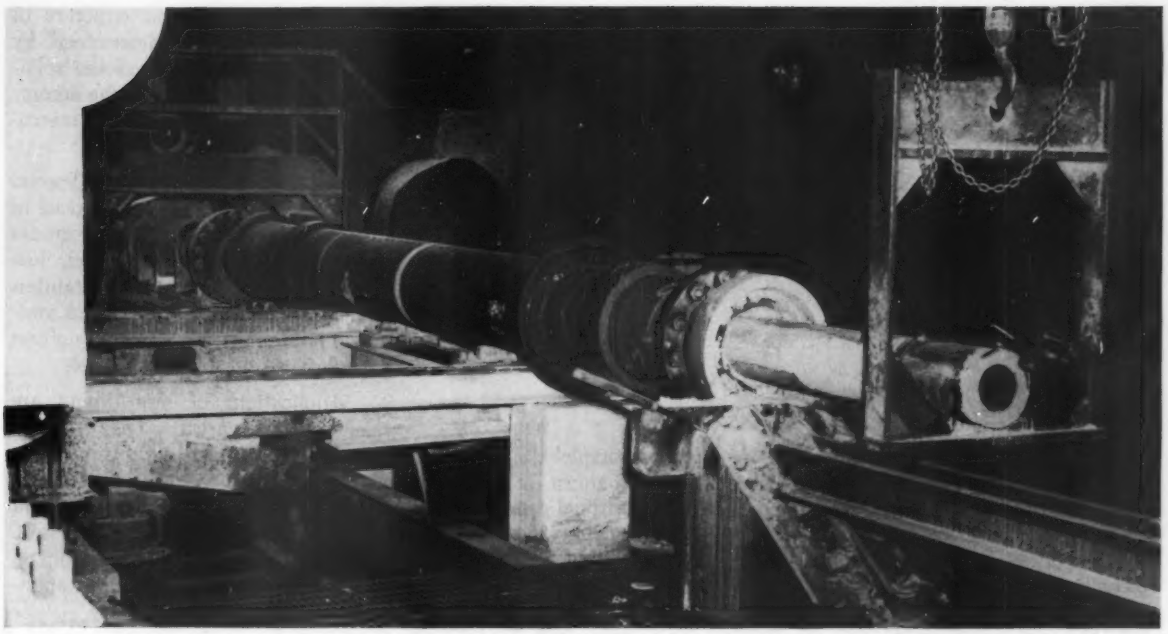
The proportion of water to solids must, of course, be controlled carefully since the weight of slurry added determines the volume and thickness of dry ceramic mold which will be produced.

Rapid spinning compacts the solid refractory constituents against the flask wall to a density and uniformity not obtainable by ramming against a pattern. In settling under high centrifugal force, the coarser particles come to the outside against the metal flask, and the finer flour particles are concentrated at the inside surface to give an extremely smooth, fine-grained casting surface. After excess water and gel material not retained in the mold wall has been drained out, special facings may be applied if needed. The mold then is ready for oven drying and baking.

Molds can be stopped off to shorter lengths than 20 ft simply by placing a ring core at the desired length and spinning in the refractory slurry on both sides of the core. This step anchors the stop-off core

Casting molten steel in steel flask with dry ceramic mold. Pouring temperatures 150° F above liquidus are satisfactory for most steels





Centrifugal steel casting from ceramic mold is stripped with a hydraulic ram and tube pulley. The ceramic mold material then is washed from the flask by high-pressure water, recovered, and reused for other molds

firmly in position in the mold.

Drying and Baking—Flasks with green centrifugally formed molds are heated in gas-fired, car-type ovens. Heating is slow at first, to remove most of the free moisture below 200° F. Then the temperature is raised to 600° F and higher and maintained until much of the combined water has been driven off.

Casting—The casting operation is carried out by pouring from a hydraulically tiltable open ladle through a pouring spout orifice and into the spinning mold. Pouring temperatures about 150° F above the liquidus are satisfactory for most steels. Pouring rates vary with the size and weight of tube cast. The operation must be fast enough to cover the mold wall without lapping, yet slow enough that the metal will be picked up by the spinning mold as poured.

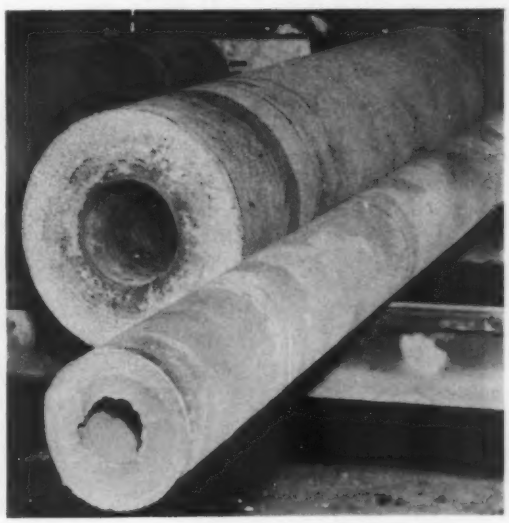
Mold spinning speeds are calculated in terms of g, or times gravity. Spinning speeds to produce a centrifugal force of around 100 g and even up to 150 g at the inside surface are used commonly. At 100 g, each pound of metal is under a centrifugal force of 100 lb.

In some types of centrifugal molds, such a high force causes hot tearing because of centrifugal hoop stress on the solidifying metal. The dense ceramic mold, however, has been found to support or cushion the freezing tube so that hot tearing normally is not encountered, even at high spinning speeds.

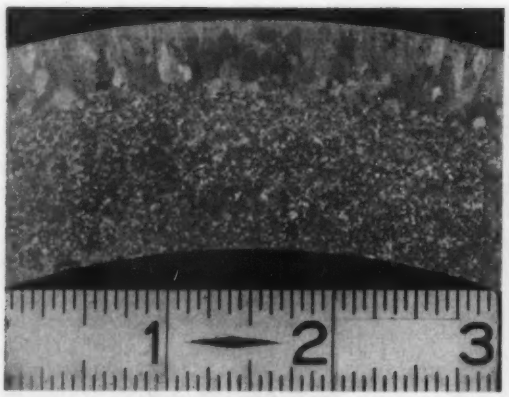
With the metal mold process, the molten metal causes expansion of the mold, with consequent increase in mold diameter. This condition can lead to cracking of the unsupported casting under centrifugal hoop stress. With the ceramic mold inside a metal flask, pouring the hot metal causes expansion of the ceramic, but not of the cooler metal flask. This characteristic results in a *decrease* of mold diameter and consequent support of the solidifying casting.

This high centrifugal force is desirable to squeeze the lighter nonmetallics out of the wall of the tube to the interior surface, where they are easily removed. Higher centrifugal force, which is feasible with ceramic molds, produces sounder, denser castings.

Spinning is continued until all the metal has solidified. Then the mold and the casting are removed from the casting machine and stripped with a hydraulic ram and tube puller. The ceramic mold ma-



As-cast, centrifugal steel castings. Carbon or ferritic steel alloys are refined by annealing, normalizing, or quench and temper heat treatment. Grain structure of austenitic alloys is determined by pouring temperature and the solidification mechanism



Macro-etched section of austenitic heat-resistant alloy (28 Cr-15 Ni) tube illustrates solidification pattern of centrifugal castings in ceramic mold. The outside and inside surfaces are as-cast—without heat treatment

terial is washed from the flask by high pressure water, recovered, and reused to produce other molds.

Solidification—When molten steel is poured into a dry ceramic mold, abstraction of heat from the metal is almost entirely through the mold wall. This action induces directional solidification from outside to inside of the wall section and columnar crystallization in the as-cast section. With thicker tube walls, and in alloys with a long freezing range, the columnar crystals extend only part-way through the tube wall.

After freezing of the columnar crystals from the outside surface, nearly all of the liquid metal is at the same temperature. Under these conditions, equiaxed crystals may form here and there throughout the liquid as the temperature gradually falls. These equiaxed crystals are denser than the liquid and are centrifuged outward, against the layer of columnar crystals, until solidification has been completed.

By this mechanism, in most steel and alloy centrifugal castings, there is no tendency toward freezing a skin of solid metal on the inside of the wall section while there is liquid metal underneath. Under high centrifugal force, a crystal of solid metal forming at the inside surface immediately is thrown outward through any remaining liquid because of its greater density.

Fluxes, exothermic or merely protective, may be applied to the interior surface of spinning tubes to prevent oxidation during freezing and to produce a smoother inside surface. Such additions are not normally required to induce directional solidification, which is inherent in the centrifugal process when high centrifugal forces are employed.

With carbon or ferritic alloy steels, the as-cast grain structure is refined by an annealing, normalizing, or quench and temper heat treatment. The grain structure of austenitic alloys is determined by pouring temperature and the solidification mechanism. See the accompanying illustration of a macro-etched section.

Applications—In Acipco's Special Products Div., tubes are produced in plain and alloy gray iron, all grades of ductile iron, carbon steel, low alloy steel, all grades of stainless and heat resistant alloys, and verious nonferrous alloys including cast Monel and 97 per cent nickel.

Applications of this tubing are many and varied. They include hydraulic cylinders and pistons, normal and high-temperature pressure piping, rolls, cylinder barrels and liners, retorts and pressure vessels. Suitable combinations of dual metal tubes are produced for special applications.

Availability of complete heat treating, machining, and other facilities permits Acipco to fabricate finished assemblies using centrifugal tubes. The tubes carry the company's registered trade mark Ceram-Spun.

Conclusion—Centrifugally formed ceramic molds for true centrifugal castings offer many advantages as to flexibility of diameter and length. Higher spinning speeds are usable without hot tears and cracking even in sensitive carbon steels. Assured concentricity guarantees circumferential wall uniformity. The dense, oven-baked ceramic mold in a vented flask contributes to the production of dense, sound castings.

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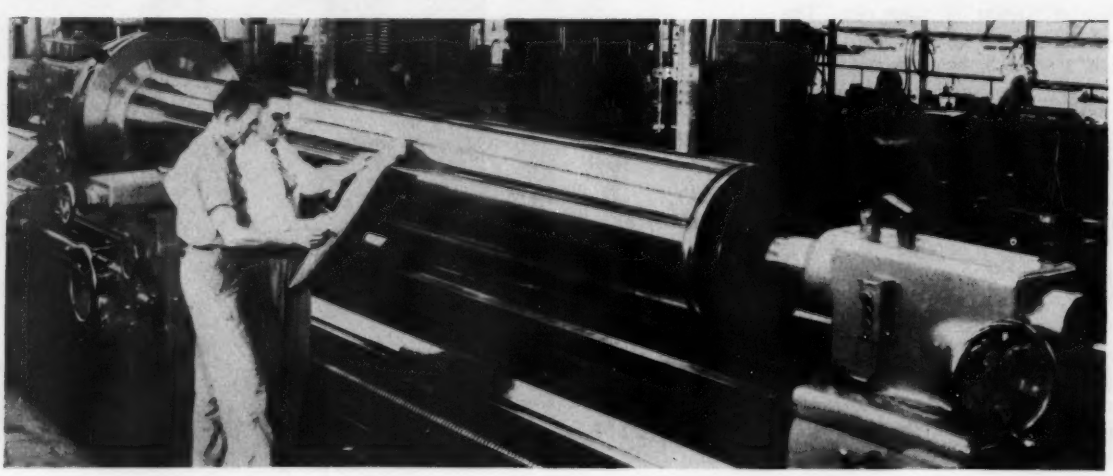
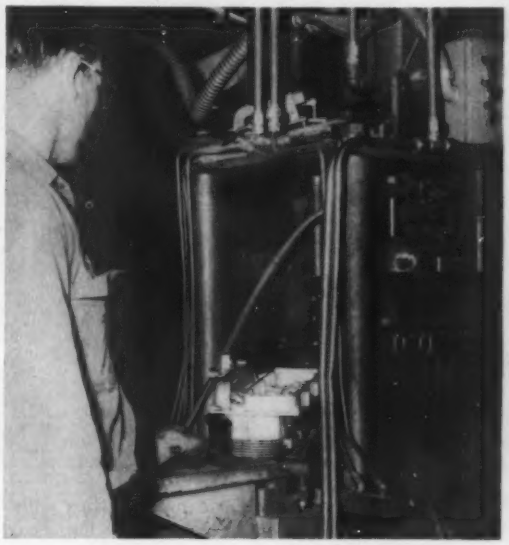
Heat treated, welded, and machined hydraulic ram in lathe. Availability of heat treating, machining, and other facilities permits finishing of assemblies



Sand cores form intake manifold and exhaust ports in the low-pressure permanent molded head casting



Casting Aluminum Parts For the Corvair Engine

A casting yield of about 96 per cent due to use of low-pressure permanent molding and minimum melting cost for aluminum provide rock-bottom raw material cost for the Chevrolet-Massena foundry

By ROBERT H. HERRMANN
Associate Editor

● CHEVROLET Motor Division's aluminum foundry at Massena, N. Y., claims an average yield of about 96 per cent on Corvair engine parts cast in permanent molds. When the economy of that degree of yield is coupled with a near zero melting cost—realized by buying molten aluminum from the adjacent Reynolds Metals Co. reduction plant—the cost of the principal raw material at this General Motors Corp. foundry is at a minimum.

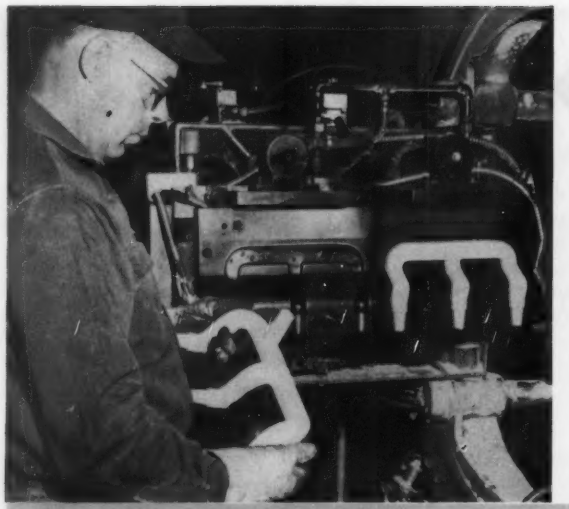
The high rate of yield is attributed to the fact that major engine parts—left and right crankcase sections, rear engine housings, oil filter adapters, and cylinder heads—are cast in low-pressure permanent mold machines. Only pistons and camshaft gear blanks are gravity poured in permanent molds. Flywheel housings, crankcase covers, idler brackets, oil cooler adapters, and automatic transmission stators and clutch housings are diecast.

Workers use hand tools to remove flash from intake manifold-heads

Low Pressure Molding—Low pressure permanent mold casting processes developed in England and Germany have been used in European foundries for many years. The process involves mounting a mold above a sealed holding furnace. Air at pressures up to 10 psi is applied to the surface of the bath, thus forcing molten aluminum up a ceramic-coated tube immersed in the metal. Aluminum flows from the other end of the tube into the mold cavity smoothly and slowly and without turbulence.

Metal introduced into molds in this manner is said to freeze from the top down in a desirable directional solidification pattern back to the source of molten metal. The low air pressure is intended to assist feeding of the casting during solidification. When the casting has solidified, the air pressure is released, the mold opened, and the casting lifted and ejected.

Equipment used at Chevrolet-Massena is similar to that used in Europe with several design changes,



Intake manifold cores are blown two in a box with furfuryl alcohol-resin-bonded sand in a hot box

Crankcase castings are gaged in a jig for conformance to dimensional tolerance at 15 check points

primarily in operating methods. Those changes involve automatic mold actuation and timing and interchangeability of molds from machine to machine, the incorporation of air and electric safety controls, and increased size and strength of the machines.

The automatic fill and hydraulically actuated molds permit one man to operate more than one machine, thus increasing his productivity. Castings produced are relatively free of oxides and generally are of high density. Casting yield is high.

The combined intake manifold-head casting is an example of the high yield in spite of the fact that it is an extremely intricate casting. The cleaned head weighs 16½ lb; total gating metal weighs a little under 3 oz. Cooling fins are formed by 17 draw blades, all interchangeable in their relative position with blades in any other mold. Whisker-size vents are incorporated at ½-in. intervals around the periphery of each fin formed by the blades to promote mold filling. In addition, the mold is subjected to a partial vacuum of about 6 psi to evacuate gas developed by sand cores used to form the intake manifold and exhaust port passages.

Use Furfuryl-Resin Binder—The cores are blown solid with a wet mix furfuryl alcohol-urea resin-bonded sand containing a GM-developed catalyst. The mix is said to have good flowability and fast curing characteristics. Exhaust port cores are made on an 18-second cycle; intake manifold cores require 25 seconds. Gas is evolved rapidly when molten metal surrounds the cores, thus making necessary the partial vacuum in the mold. The cores also are said to have good collapsibility.

From the moment cores are set in the mold the production cycle in each cylinder head casting machine is 7 minutes, 45 seconds until the casting is removed and the next cores set. One man operates four machines. Actually only three are in production; the fourth is down for maintenance on machine, furnace, and mold. Heads are cast in 36 machines, each mounted over a 2000-lb capacity induction holding furnace. Twenty-four machines are situated on one line, and 12 on the other. Twelve additional machines are being added to the second line in readiness for 1961 model production.

Right and left half crankcase housings are made on 16 low-pressure permanent mold machines mounted on 750-lb capacity induction holding furnaces. One man operates three machines, each of which requires a 4½-minute production cycle. The yield on these 16-lb half crankcases is almost as good as that for the head; gating metal weighs ½ lb.

Dimensions Are Critical—These castings must meet rigid tolerance requirements. Each casting is gaged in a jig at the end of the production line and must be within ±0.010 in. of true dimension at 15 check points.

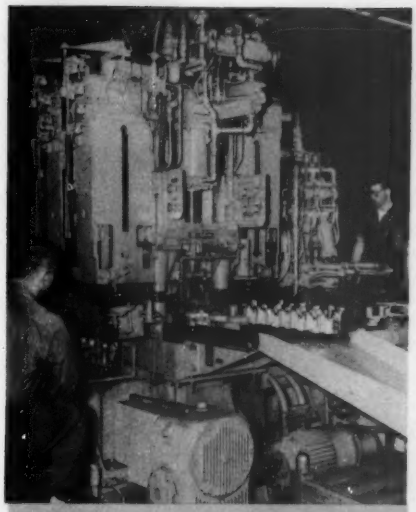
The line producing rear engine housings is equipped with 11 low-pressure machines mounted on 1000-lb capacity holding furnaces. One man operates three machines which are on a 4-minute cycle. These castings also must meet close tolerance requirements. They are gaged at 12 points for acceptance within ± 0.010 in. of dimension.

Head, crankcase half, and rear engine housing castings are carried on a common monorail conveyor through an overhead, electrically heated oven for stress relieving at 400° F for 4 hr.

Oil filter adapters are cast in four low-pressure machines mounted on 750-lb capacity electric resistance rod heated furnaces. The trimmed casting weighs 1½ lb, and the gate weighs ¼ lb.

Camshaft gear blanks are hand poured, two in a mold, in one standard permanent mold machine. After trimming, the castings are heat treated at 900° F for 4 hr, quenched in water and stress relieved for 2 hr at 400° F.

Design New Piston Machines—The foundry's newest permanent mold machines are rotary automatic piston casting units, each capable of producing 600 steel-strutted, alu-



Rotary automatic machines can cast 600 aluminum pistons an hour

minum pistons an hour. The machines, developed by the Process Development Section, GM Technical Center, Detroit, incorporate two synchronized, four-station rotary tables. All operations are completely automatic. Three of those machines are being set up for piston production.

On one rotary unit the three-part cores for two castings are cooled at the first station by a wet air blast, assembled at the second station as each picks up a steel reinforcing strut, and, at the third station, are set in two molds on one station of the second rotary table. It indexes, bringing two cooled molds in position. They open and the pistons are transferred to the first rotary unit. It indexes to its fourth station where the cores are collapsed and the pistons ejected to a cooling table.

Meanwhile the second rotary table has indexed the cored molds to the pouring station. Sufficient molten aluminum for two molds is drawn from a 2200-lb capacity electric holding furnace through a tube to a chamber evacuated to −8 osi pressure. When the desired quantity of metal is in the chamber, it is forced by air at +16 osi pressure up a second tube to a Y-shaped trough which supplies metal to the two waiting molds.

The castings solidify and cool at the next two stations. Water is circulated through the molds and cores. That is accomplished in the cores by having two tubes at the fourth station pivot down to contact two openings in the top of each center core segment. Thus water is circulated through the core during its rest at that station.

As-cast pistons are loaded from the cooling table to fixtures on a belt conveyor for movement to automatic degating, rough machining, and weighing. Rough machined pistons are stress relieved at 900° F for 8 hr.

Diecast parts are produced in ten machines ranging in capacity from 400 to 800 tons locking pressure. Workers stationed at the diecasting machines also load castings into hydraulic trim presses at their work station. They also inspect and segregate the castings they produce.

Quality Control — The control program begins with tests on all incoming materials. A sample of molten metal is taken from both 9000-lb capacity covered ladles as soon as they are brought into the foundry on a special tractor-trailer truck from the reduction plant less than a mile away. The samples are sent to the laboratory in a pneumatic tube carrier, and results of the analysis are obtained within ten minutes. Meanwhile the metal in the ladles is being fluxed with chlorine. Approved metal is poured into any of fourteen 30,000-lb electric holding furnaces where it is held at 1400-1500° F. Magnesium, titanium-boron, and manganese additions are made in the holding furnaces to alloy the metal. Samples from these furnaces are checked at regular intervals on a quantometer to maintain close alloy control.

Incoming sand and binders as well as the core sand mix and the finished cores are checked. Tests are run on lubricants, mold coating materials, hydraulic fluids, cleaning solutions, and tool steels.

Castings are checked visually by each machine operator for misruns, broken core pins, excessive flash, and general appearance. Inspection department personnel make visual inspections on a sampling basis and periodically send sample castings to the layout room for dimensional checking. Hardness, tensile, and yield strength tests are made on a sampling basis as are radiographic examinations for shrinkage, cracks, and porosity. Such tests, made with x-ray equipment or on a fluoroscope, pin point any possible defects early so corrective action can be made in production techniques. Sample castings also are analyzed for structure of various alloys as cast and after various heat treatments.

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Molten aluminum, in 9000-lb-capacity ladles delivered by truck from nearby reduction plant, is poured into 30,000-lb electric holding furnaces

Operator compares plaster model segments of a tire tread with a drawing for dimensional accuracy and for inclusion of proper shrinkage factors

Hard plaster slurry is poured against the gel and model assembly, producing a flexible mold employed in making a plaster duplicate of the model

DUCTILE IRON TIRE

. . . Cast By Complex Process

Plaster, elastic vinyl polymer gel, resin-bonded sand, and green sand play a part in the production of four different types of ductile iron molds employed in producing tires

● DUCTILE IRON castings for automobile tire molds constitute most of the production at the Cedarville, Ohio, plant of Morris Bean & Co. Production at the Cedarville plant started in 1954. Since then several thousand ductile iron tire molds of four basic types have been cast.

These types include the following: 1. Tread bands, which require separately cast or otherwise fabricated components to form the side walls and beads of a tire. 2. Tread rings, which include the buttress forming the side walls, but require a separate former for the beads. 3. Full tire mold shells, to form the tread, side walls, and beads. 4. Integral tire molds which form the tread, side walls, and beads and are heavy enough not to require back-up sections for support during tire making.

The first three types require separately produced back-up sections. The tread-forming section of each of the four types of molds consists of two halves split near the centerline of the tread.

Ductile iron tire molds are desired by some manufacturers because of the different types of curing equipment used for tire production. Much of the equipment employs ferrous back-up sections for tire molds. Also, steam generally is used to provide heat to cure the tire, and in some types of curing equipment the steam comes in direct contact with the mold. Consequently, if nonferrous tire molds are used, problems of corrosion from galvanic action can occur. These problems can be aggravated if the

Stainless steel sipes, which produce tread fissures, are hammered into a soft plaster duplicate of the model

MOLDS

By ROBERT H. HERRMANN
Associate Editor

Worker cleans hard plaster master reverse segment made from soft plaster duplicate of the model. The final casting resembles the master reverse

water is hard and contains certain chemicals.

In addition, the possibility of excessive flash rubber on tires at mold joints, as a result of uneven expansion of different metals when heated, is eliminated. Strength and wear resistance also are factors. Nicks, dents, and general wear resulting from assembly and disassembly of equipment during tire production reduce mold life.

Foundry molds for all types of ductile iron tire mold castings produced at the Cedarville plant are made up of baked, resin-bonded core segments assembled in a ring and set in a green sand cope and drag mold. The castings resulting from the over-all process have an inside diameter accuracy of better than 0.001 in./in. on tire molds up to 30 in. in diam. Finish of the tread surface is in the range of 150 to 200 microinches rms.

Use Plaster Models—Tire manufacturers furnish the foundry with plaster segment models of a tire tread. Sufficient segments to cover the desired pitch sequence in the tire design are supplied. Three or four model segments usually are sufficient for the complete tire. From these, after rather complicated processing, the correct number of resin-bonded sand segments is produced to make a complete ring core.

Each of the model segments supplied is lettered, and this lettering is carried through to the final core segments. A drawing supplied with the models specifies the correct sequencing of segments to form the ring core. The sequence is important because variations exist in the

tread design on each model segment to achieve a low noise level and smooth running characteristics in the tire. The variations involve small changes in width and configuration of fissures and protuberances comprising the tread design. Proper sequencing of variations within each segment and from segment to segment has been developed through extensive research by the tire companies.

When the models arrive at the foundry, they are inspected and checked against the drawing. The models also incorporate shrinkage factors for metal and for the elastic vinyl polymer gel used to duplicate work before the core segments are made. These factors also are checked before the models are accepted.

Modeling clay is applied to the tread face of the accepted segment model to a thickness of about ½ in. Aluminum side plates and end blocks at the correct angle to the ends of the segment model are clamped against the model. These extend above the clay build-up, and a plaster slurry is poured over the clay in the box-like enclosure thus formed. When the plaster has set, it is removed from the box, and the clay is taken off the model.

Make Flexible Gel Mold—A pouring hole is cut in the fresh plaster cover thus formed, and it is placed back in the box. Molten elastic vinyl polymer gel at about 200° F is poured through the hole in the cover into the space previously occupied by the clay.

When the gel has set, plates and end blocks are removed, and a hot knife is slipped between the gel and the plaster cover to remove it without disturbing the gel on the model. The cover is discarded. Short lengths of coiled copper wire are heated and inserted in the back of the gel to a depth half the diameter of the coils.

The model and gel assembly is clamped in the plates and end blocks, and hard plaster slurry is poured against the back of the gel, the coiled wire forming a mechanical interlock with the plaster. Plates and blocks are disassembled and the model stripped from the gel. The flexible mold thus formed is used to form a plaster duplicate of the model.

The gel with its plaster backing for rigidity is reassembled in the plates and blocks, and soft plaster poured against the gel. The resulting segment is an exact duplicate of the original model.

After this has been stripped from the gel, sipes are inserted into the tread design. These are small pieces of 18-8-302 stainless steel which form fine fissures in the tire tread. Workers hammer in the sipes by hand to an accuracy of ±0.005 in. of true location. Gages and templates are used to check positioning against markings on the model.

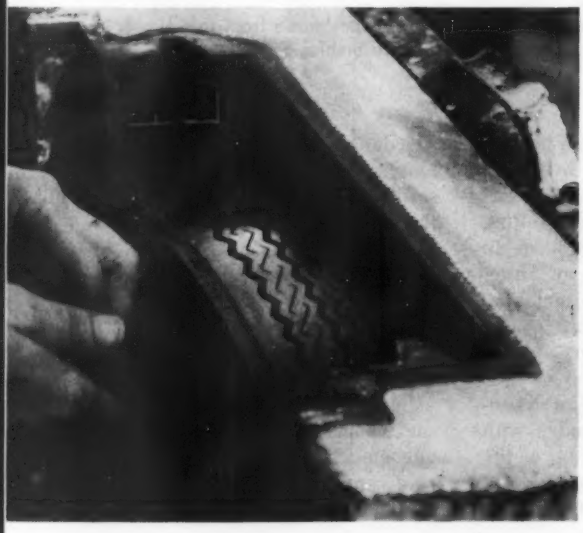
Produce Master Pattern—Aluminum plates and end blocks are clamped around the segment at the proper angle. A liquid soap solution is brushed on the tread surface of the soft plaster segment as a parting agent. Hard plaster, colored green, is poured to form a master reverse segment which will be reproduced in the final casting. Thus it may be called a master pattern.

Plates and end blocks are removed, and the soft plaster is knocked away from the green-colored master reverse, which now has the sipes embedded in its tread surface. Workers use small hand tools to remove any small amounts of soft plaster which remain in the tread design of the master reverse. Inspectors check dimensional tolerances carefully against customer specifications.

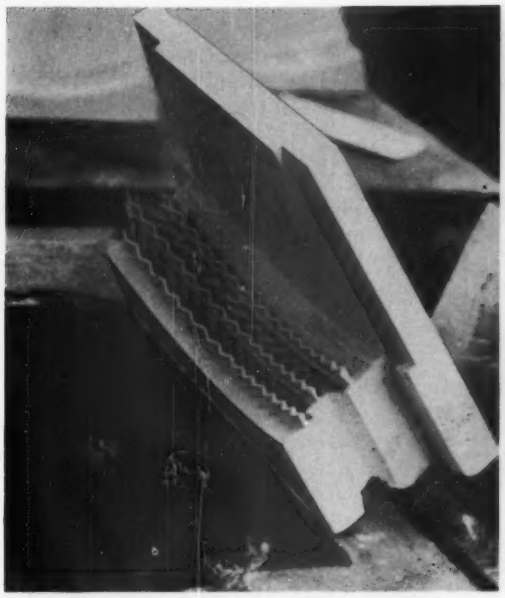
Clay is built up on the tread face, the segment is clamped in plates, and a plaster cover is poured. With the plates removed, the plaster cover is lifted, the clay peeled off, and the master reverse dried in an oven for 10-12 hr at 180° F. A pouring hole is cut in the plaster cover.

The dried master reverse and the plaster cover are reassembled in the plate and end block enclosure, and molten gel is poured into the space left by the clay. The solidified gel is keyed to a hard plaster back with coiled wire as described previously. This process results in an elastic vinyl polymer gel pattern from

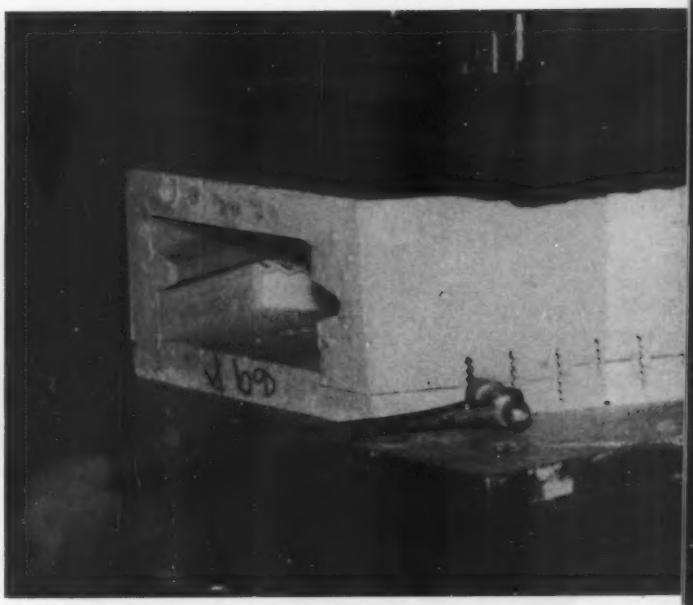
Worker sets sipes in fissures of gel mold. They are transferred to a disposable production pattern



Gel mold is clamped in plates and soft plaster is poured to make the disposable production pattern



Plaster-retaining plates are removed and the production pattern is stripped from the flexible gel



The pattern is assembled with corrugated fasteners to a three-sided plaster shape to form a corebox

which a plaster waste pattern is made. In subsequent operations, the final resin-bonded sand mold is made from the waste pattern.

The numerous steps described and the use of vinyl gel patterns in the process are required because of the intricacies and unique undercuts present in tire tread designs. Vertical surfaces of ribs in the design lie along radius lines from the center of an imaginary sphere. In addition, protuberances are incorporated on the vertical surfaces of ribs in certain designs to reduce tire squeal and achieve other desirable features in the tire.

Making Foundry Cores—Molders insert sipes into fissures in the vinyl gel pattern. The fissures previously were formed by sipes embedded in the master reverse. The gel pattern is clamped in aluminum side plates and end blocks at the proper segment angle, and a soft plaster is poured against the gel. A wooden cover with bottom contoured to the same curve as the tread face of the gel pattern is set on top of the poured plaster. Shoulders at the ends of the cover rest on the end blocks, thus forming a waste pattern segment which is a production duplicate of the master reverse. Excess plaster is squeezed out of the assembly when the cover is set in position.

When the plaster has set, the plates and end blocks are taken off, and the plaster segment is stripped from the flexible gel mold. Workers clean excess plaster off the tread face of the plaster waste pattern with hand tools. This material consists mostly of flash around the sipes now embedded in the plaster. The cleaned pattern is placed in a three-sided soft plaster box with the tread side up. Sides and ends of the box extend about 5 in. above the face of the pattern. The ends of the box forming mating surfaces

The plaster box is filled with resin-coated sand and baked to form a finished core segment

of the segments are tapered at the proper angle so the resulting resin-sand segments may be assembled to form a circular core for insertion in a green sand mold.

The fourth side of the box is put in place with corrugated fasteners hammered into the plaster. This side has two holes into which bolts are inserted with the heads near the center of the box cavity. They will be surrounded by the resin sand mix which subsequently is poured into the box and also will hold the segment in place on the index table on which segments are assembled into a circular core.

The box is filled with a resin coated sand and clamped on a vibrating table. Men load the boxes of compacted sand on racks which are fork-trucked into a gas-fired, recirculating oven held at 450° F. During the early part of the 8½-hr baking period, the plaster pattern dehydrates. When it dries, the temperature rises, resin in the core segment cures, and the calcium sulfate in the pattern is converted to soluble anhydride. In this condition the pattern is relatively weak.

Lift truck operators haul the racks from the oven. When the core-pattern assemblies are cool enough to handle, workers break the plaster box and pattern with hammers to remove them from the core segment. Any adhering plaster is removed by soaking in water or

Resin-sand core segments are assembled and bolted on an index plate. Proper positioning is critical

with a water jet. Cleaned, resin-bonded sand segments are reloaded on the racks for return to the oven and drying at 450° F for 2 hr.

Cooled segments are inspected and gaged on a fixture with gaging points adjusted to the original model segment. Repair work is performed on any core segments which require it.

Assembling Cores—Segments are assembled on cast, ductile iron, circular index plates machined flat. The plate is mounted on a stand which also has a precision machined keyway in which a gage plate slides. Gages and stops on the plate are set by measurement from a spindle at the center of the index plate. The stops are brought to the table periphery, and each core segment is located individually by the gages. Segments are held in place by the embedded bolts which are inserted in comparatively large diameter holes in the index plate.

The assembled segments form a wheel with the tread face at the periphery, extending slightly beyond the edge of the index table. When placed in a green sand mold, this ring core forms half a tire mold with parting line near the center of the tread face. Because the segments are truncated circle segments, the hub of the wheel is open except for the spindle for measurement reference. Green sand is rammed into the open area around the spindle.

A ring is screwed on the spindle, and a bridge crane lifts the index plate, containing the core assembly, and sets it in a green sand mold which forms the outside of the tire mold casting. The cope and drag mold halves are made in 5-ft diam, barred steel flasks on a jolt table supplemented by hand and pneumatic tool ramming. Wooden patterns form the ring core cavity and the gating system. Because four types of tire mold castings are produced, gating and risering systems must be varied to meet the requirements of each. Basically these involve a circular runner with finger gates to the ring cavity. Risers are placed to meet the feeding needs of the different types of tire mold castings.

A standard, muller - prepared green sand mix is used. It consists of 550 lb lake sand, 300 lb tank sand, 90 lb western bentonite, 40 lb sea coal, 7½ lb wood flour, and 3 per cent moisture. Permeability is 80-90, green compression strength is 16-18 psi, and hardness is 80-90.

Metal Preparation — The base iron for production of ductile iron is melted in any one of three low-frequency induction furnaces of 5000-lb batch capacity. One furnace is used at a time and is operated continuously for 6 to 8 months before relining and rebuilding. The second furnace is in standby condition, and the third is being rebuilt. Furnaces have a neutral lining, block in the sides, and monolithic material on floor and roof.

Furnaces are charged through the top by an elevating chute. A 400-lb charge consisting of 245 lb returns, 130 lb pig iron, and 25 lb of 98 per cent pure iron ingot is introduced every 20 minutes. Metal is tapped at 2850° F into 1300-lb capacity ladles carried on the scale hook of a bridge crane.

The inoculating alloy is made up of 50 per cent Ni, 29 per cent Si, 14 per cent Mg, balance iron. Seventeen ounces of this alloy per 100 lb of iron is dumped in the bottom of a hot, dry ladle, and the base iron, now at 2740° F, is poured on top. This mixture is post-inoculated with 11 oz per 100 lb of 85 per cent ferrosilicon which is added gradually as the metal is poured back to the original ladle. Molds are poured at 2400 to 2650° F.

The metal analysis is as follows:

At the Spout		After Treatment
3.65	C	3.65
1.90	Si	2.70
0.01 - 0.02	S	slightly less
0.02 - 0.03	P	0.02 - 0.03
0	Mg	0.04
0.7	Ni	1.0
0.03	Cr	0.03

Typical mechanical properties are 75,000 psi tensile strength, 50,000 psi yield strength, and 16 per cent elongation in 2 in.

Cleaning and Sizing—Molds are moved by crane to the knockout area. The crane lifts off the cope, then lifts the casting out. The index plate is pulled out and the bolts

Core assembly is set in drag, foreground, and green sand rammed in the center, background

Molds are poured with ductile iron at 2400 to 2650° F. Metal is melted in any of three low-frequency induction furnaces and inoculated in ladles

previously embedded in the core segments are removed for re-use.

Workers break the finger gates from the casting with hammers. The castings, with risers attached, are sand blasted in a room. Then risers are cut off with an oxyacetylene torch.

The inside diameter of the castings is inspected visually and dimensions checked. This is the critical part of the casting because it contains the tread face.

Workers use pneumatic chisels to remove riser and gate stubs. Any flash on the tread face resulting from the joints of the core segments is removed with hand chisels.

Castings then are gaged on an index table for conformance to radial tolerances. The existing dimensions thus determined show the amount a casting must be stretched in a subsequent operation. Castings purposely are cast to about 0.020 in. undersize, then stretched beyond the yield point of the metal to about 0.010 in. undersize. That procedure is necessary because ring-shaped parts can not be cast perfectly round.

The castings are stretched in a hydraulic pull-down press. Workers place a tread ring over expanding segments of the machine. The hydraulic piston pulls down a central-tapered, machined, and hardened plug. It forces the accurately machined segments outward against the shoulder on one edge of the ring and against the split line of the tread face on the other edge of the ring. A high degree of worker skill is required because the amount of pressure applied is critical. Excessive pressure ruins the casting. Also, both halves of the tire mold must be stretched to the same degree of accuracy. The skill for this job can be acquired only through experience.

Stretched castings are given a final radial check, then banded in pairs to form a mold unit and shipped.

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Tread castings are gaged on index table for conformance to radial tolerance. Rings can not be cast round and must be stretched to size

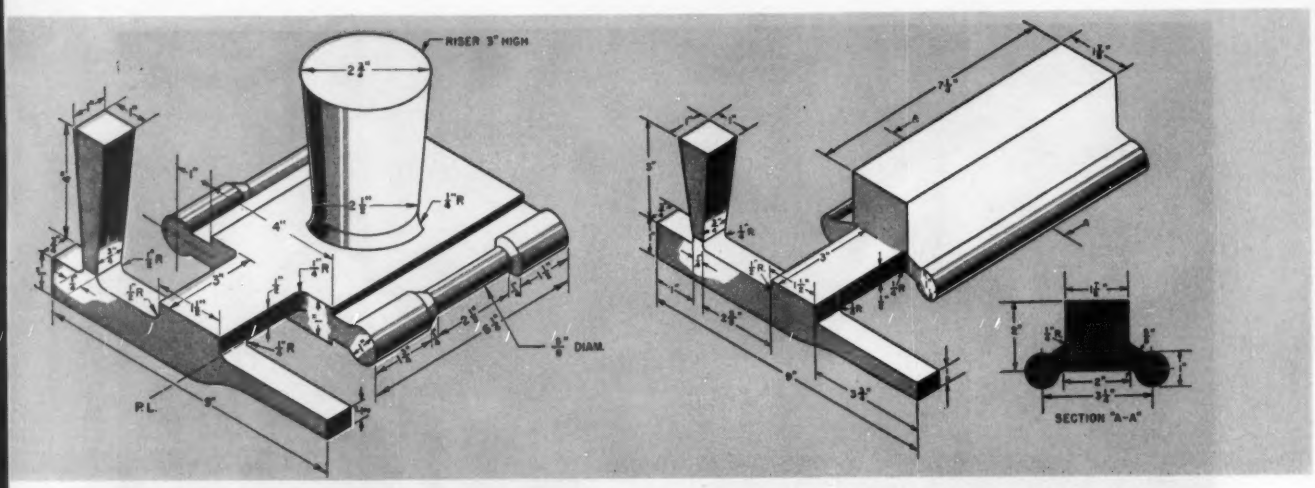

Fig. 1—Double horizontal full-web test bars, very similar to ASTM recommended practice B208-54. Some modifications have been made in the gating

Fig. 2—When specimens larger than ⅝ in. diam were required, the modified 1-in. web-Webbert test bar casting shown here was used

Properties of 80-10-10, 85-5-5-5, and Navy "M" Alloys

New uses for standard cast copper-base alloys are expected as data on their mechanical and physical properties are published. Here is a concise report on basic properties of three copper-base alloys

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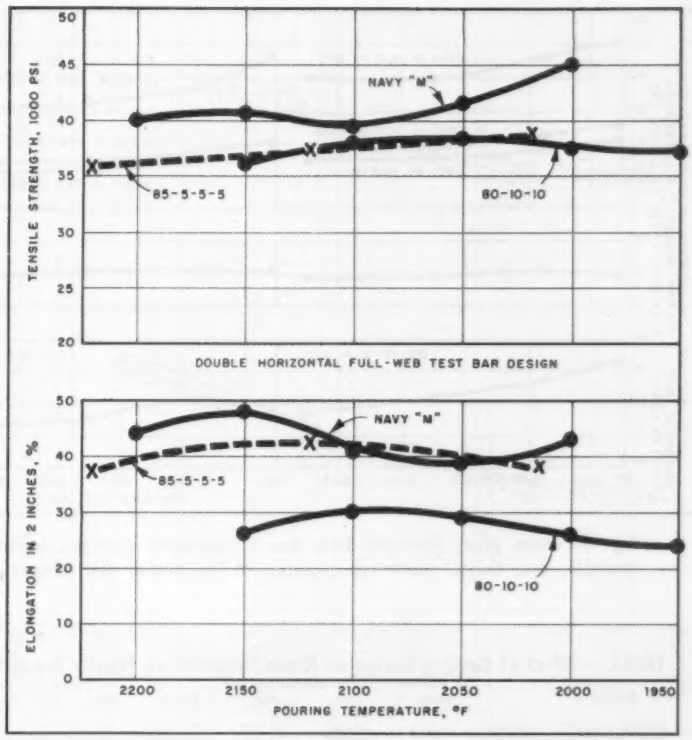
● IN THIS DAY of technological achievements in nuclear energy, missiles, and space satellites, the exotic metals and the new ferrous and nonferrous alloys have received considerable publicity. An insatiable thirst exists for knowledge of the properties of metals in unusual environments. At times, it appears that new metals were used in certain applications because (1) data on the pertinent properties did not exist for the common metals, or (2) the common metals were not expected to possess the properties that were desired.

Even in the everyday applications, greater knowledge of the properties of one common metal has led to its substitution for another common metal. Progress is a must. Technology is the leader. Thus, this constant challenge of one metal replacing another has demanded that more knowledge be gained of a particular metal if that metal is to retain its proportionate share of our expanding national economy.

Need Exists—Only recently has this philosophy been applied to the cast copper-base alloys. The need for action is exemplified by the fact that the annual aluminum consumption during the last ten years has been increasing at a remarkable rate whereas the production of bronze ingot has actually decreased.

For more than 30 years the Brass and Bronze Ingot Institute has been

Fig. 3—Effect of pouring temperature on tensile properties. Data on 85-5-5-5 alloy from G. H. Clamer, "Test Bars For 85-5-5-5 Alloy, Their Design and Some Factors Affecting Their Properties," *Transactions*, AFS, Vol. 54, 1946, p. 24



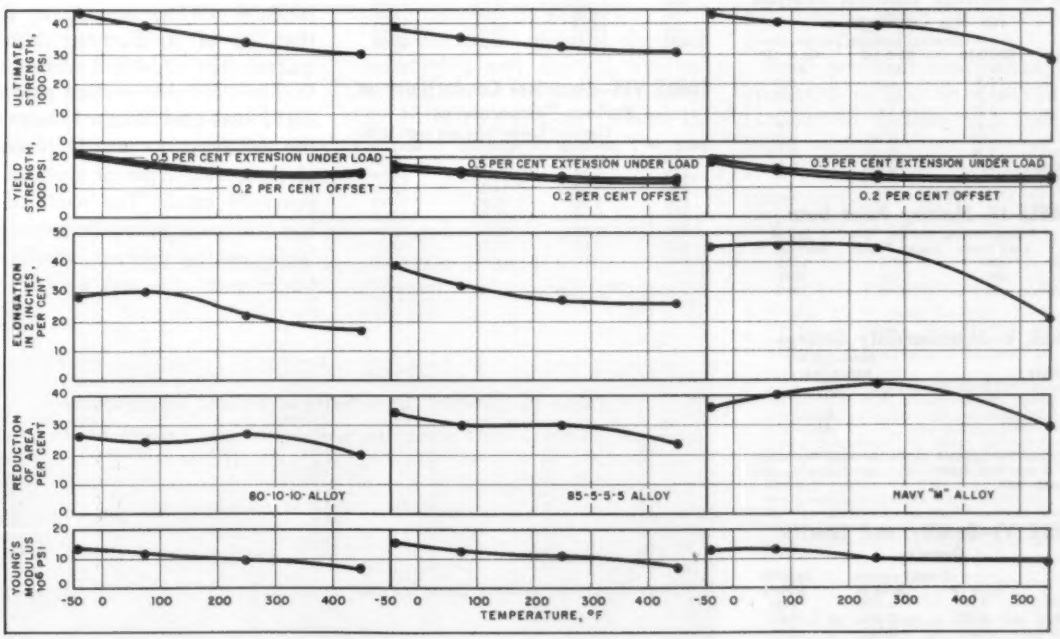
actively promoting the ingot industry as well as the foundry industry. A continuing program on a more intensive basis was initiated several years ago. Its purpose is to make available authoritative data on the mechanical and physical properties of the standard cast copper-base alloys.

This information is in great need by design engineers, architects, purchasing agents, and others who are concerned with specifications and product development. Data exist on some of the properties, but their authenticity is not precisely known. Authoritative data on properties at elevated temperature are practically nonexistent.

This article presents data that have been obtained on three alloys: 80-10-10, 85-5-5-5, and Navy "M." Seventeen properties are reported. The information provides the foundryman with an opportunity to appraise more fully the full potentialities of these alloys. Cognizance of these properties on the part of the foundryman is necessary since it is expected that designers will utilize these data to develop new uses for these alloys—uses which could not be conceived until these data had become available to the users.

Representative Data—The values reported here are considered representative of the properties that could be duplicated by the average brass foundry that employs good foundry

Fig. 4—Tensile properties versus temperature. Although there are maximums in some cases, the properties exhibit a tendency to be lower at higher test temperature



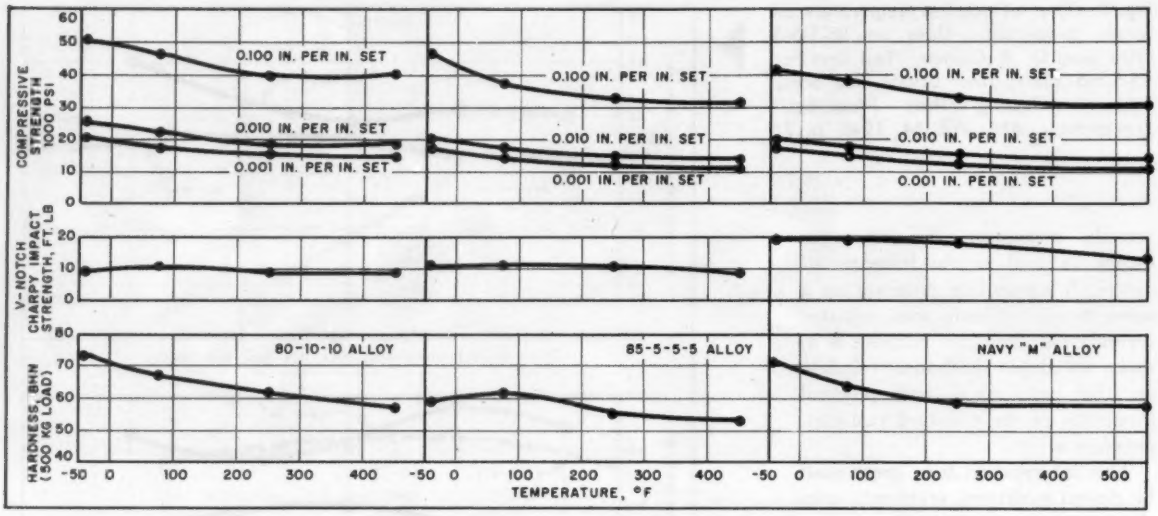


Fig. 5—These plots illustrate how the compressive strength, V-notch Charpy impact strength, and Brinell hardness decrease at the higher test temperatures

TABLE I—Effect of Casting Design on Room-Temperature Tensile Properties

Design	Pouring Temp, °F	Tensile Strength, psi Max.	Min.	Avg.[a]	Elongation, % Max.	Min.	Avg.[a]
80-10-10 Alloy							
Double horizontal full-web	2075	38,400	37,400	38,000[4]	31	29	30[4]
Modified 1-inch web-Webbert	2090	34,800	34,300	34,600[3]	26	24	25[3]
85-5-5-5 Alloy							
Double horizontal full-web	2160	35,000	35,000	35,000[3]	35	33	34[3]
Modified 1-inch web-Webbert	2135	32,800	31,800	32,300[4]	33	30	31[4]
Navy "M" Alloy							
Double horizontal full-web	2150	41,700	40,000	40,800[4]	52	46	48[4]
Modified 1-inch web-Webbert	2140	36,900	36,200	36,500[4]	42	38	40[4]

[a]Superscript numerals indicate the number of specimens.

TABLE II—Patternmaker's Shrinkage

Alloy	Shrinkage, in. per ft
80-10-10	1/8
85-5-5-5	11/64
Navy "M"	3/16

TABLE III—Average Chemical Analysis for the Castings

Element	Chemical Analysis, per cent 80-10-10	85-5-5-5	Navy "M"
Copper	79	85	88
Tin	9.3	4.4	5.7
Lead	10.2	5.1	1.4
Zinc	0.27	4.6	4.4
Nickel	0.43	0.7	0.6
Iron	0.01	0.11	0.07
Antimony	0.26	0.17	0.13
Phosphorus	0.01	0.01	0.01

TABLE IV—Melting Point Data

Alloy	Beginning of Melting, °F— Lead Phase	Copper Phase	End of Melting, °F
80-10-10	598	1403	1705
85-5-5-5	601	1568	1849
Navy "M"	...	1518	1810

TABLE V—Machinability Ratings

Alloy	Machinability Rating Index
Free-cutting brass[a]	100
80-10-10	97
85-5-5-5	84
Navy "M"	42

[a]Nominal composition of the wrought bar stock with 61.5 per cent copper, 35.5 per cent zinc, and 3 per cent lead.

TABLE VI—Density and Specific Gravity

Alloy	Density g/cu cm	lb/cu in.	Specific Gravity
80-10-10	8.99	0.325	9.00
85-5-5-5	8.82	0.318	8.83
Navy "M"	8.64	0.312	8.65

TABLE VII—Electrical Resistivity at Various Temperatures

Temp., °F	Electrical Resistivity, microhm-cm— 80-10-10	85-5-5-5	Navy "M"
68	17.01	11.43	12.04
150	17.63	11.87	14.46
200	18.00	12.13	12.71
250	18.38	12.42	12.97
300	18.76	12.70	13.22
350	19.15	12.99	13.48
400	19.53	13.28	13.74
450	19.92	13.59	13.99

TABLE VIII—Electrical Conductivity at Various Temperatures

Temp., °F	Electrical Conductivity, per cent, IACS* 80-10-10	85-5-5-5	Navy "M"
68	10.14	15.08	14.32
150	9.78	14.52	13.84
200	9.58	14.21	13.56
250	9.38	13.88	13.29
300	9.19	13.58	13.04
350	9.00	13.27	12.79
400	8.82	12.98	12.55
450	8.65	12.68	12.32

*IACS=International Annealed Copper Standard.

practice. Because of its convenience, a silica-lined, high-frequency induction furnace was used in the research program. The charge consisted of ingot metal which was melted without a cover. Two ounces of 15 per cent phosphor copper per 100 pounds of charge was used for deoxidizing the melts. Test coupons were cast in natural green sand molds.

Most of the properties were determined on coupons taken from the double horizontal full-web test casting shown in Fig. 1. This test-bar casting design is similar to Fig. 3 of ASTM Recommended Practice B208-54. When specimens larger than $\frac{5}{8}$ in. in diameter were required, the modified 1-in. web-Webbert test bar casting shown in Fig. 2 was used. Table I shows that the difference in tensile properties of these two types of castings was generally small. The modified bar had the lower properties because its larger section thickness results in a larger grain size and a more open

TABLE IX—Thermal Conductivity at Various Temperatures

Temp., °F	80-10-10 Btu/ft/hr/sq ft/°F	IACS*	85-5-5-5 Btu/ft/hr/sq ft/°F	IACS	Navy "M" Btu/ft/hr/sq ft/°F	IACS
68	27.5	12.1	41.6	18.3	40.2	17.7
100	27.7	12.2	42.4	18.6	40.7	17.9
150	28.8	12.6	43.8	19.2	41.7	18.3
200	29.7	13.0	45.2	19.8	42.8	18.8
250	30.6	13.4	46.8	20.6	44.0	19.3
300	31.7	13.9	48.5	21.3	45.5	20.0
350	32.8	14.4	50.3	22.1	47.3	20.8
400	34.0	14.9	52.5	23.1	49.4	21.7
450	35.4	15.6	54.6	24.0	50.4	22.1

*IACS=International Annealed Copper Standard

Fig. 6—Fatigue characteristics. At 100 million test cycles, the mean fatigue limits of all three copper-base alloys fall between 11,000 and 13,000 psi

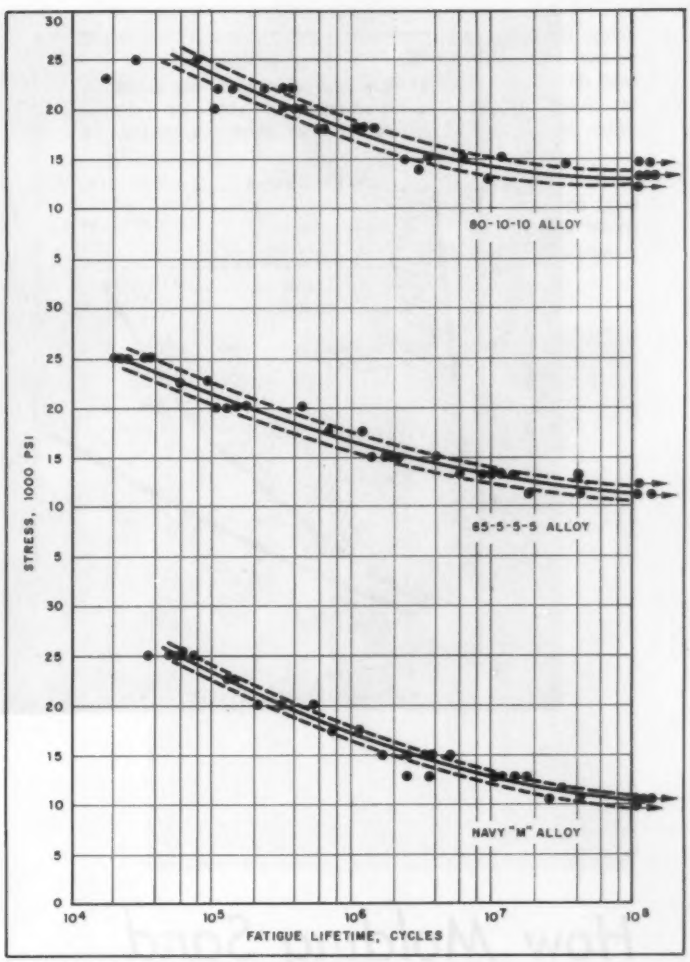


TABLE X—Mean Linear Thermal Expansion Coefficients for Various Temperature Ranges

Temp. Range, °F	Coefficient, 10^{-6} in./in./°F 80-10-10	85-5-5-5	Navy "M"
68 to 150	9.88	9.75	9.27
68 to 200	10.00	9.85	9.43
68 to 250	10.11	9.95	9.60
68 to 300	10.17	10.00	9.74
68 to 350	10.25	10.04	9.84
68 to 400	10.30	10.06	9.95
68 to 450	10.35	10.16	10.08
68 to 500	....	....	10.15
68 to 550	....	....	10.25

structure. Patternmaker's shrinkage was measured by a modification of the method described by Pilling and Kihlgren.[1] The results are given in Table II.

Optimum Tensile Properties—Pouring temperatures were in the range of 2065 to 2030° F for the 80-10-10 alloy and 2175 to 2135° F for the 85-5-5-5 and Navy "M" alloy. These temperature ranges result in optimum tensile properties as deduced from Fig. 3. Average chemical analysis for the castings is given in Table III.

Tensile properties at temperatures ranging from −40° F to +550° F are presented in Fig. 4. Data on compressive strength, Charpy impact strength, and hardness at these temperatures are given in Fig. 5. Fig. 6 shows that the mean fatigue limit at 100 million test cycles is 13,000 psi for the 80-10-10 alloy and 11,000 psi for both the 85-5-5-5 alloy and the Navy "M" alloy.

Data on the melting point of the alloys are presented in Table IV. Machinability ratings are given in Table V. Density and specific gravity are recorded in Table VI.

The electrical resistivity, electrical conductivity, and thermal conductivity at various temperatures up to 450° F are presented in Tables VII, VIII, and IX, respectively. The coefficients for thermal expansion for a number of temperature ranges are given in Table X.

Some pertinent data on the creep properties of the three alloys are summarized in Tables XI and XII. More extensive treatment of the creep data is given in the original publication, one of two papers[2] on which this article is based.

TABLE XI—Creep and Stress-Rupture Strength

Alloy	Temp., °F	Creep Strength, 1000 psi: Creep Rate of 0.00001%/hr	Creep Rate of 0.0001%/hr	Rupture Strength, 1000 psi: 100 hr	1000 hr
80-10-10	350	10.4	15.9	28.9	...
	450	7.4	11.0	18.8	15.0
	550	1.8	4.2	13.9	...
85-5-5-5	350	12.5	22.3	26.6	...
	450	11.1	13.5	19.0	15.4
	550	7.0	9.9	12.4	9.6
Navy "M"	350	16.0	25.6	33.1	...
	450	11.2	14.1	22.2	...
	550	6.2	10.2	14.4	11.7

TABLE XII—Creep Rate in 10,000-Hour Test as a Measure of Stability of the Alloys at High Temperature

Alloy	Temp., °F	Stress, psi	Creep Rate, %/hr: Second Stage	Final	Transition to Third-Stage Creep: Hr	Plastic Strain, %
80-10-10	450	8,000	0.000015	0.000030	6,700	0.16
85-5-5-5	450	10,000	0.000003	0.000003	>10,000	>0.12
Navy "M"	550	7,000	0.000017	0.000047	2,500	0.06

REFERENCES

1. Pilling, N. B. and Kihlgren, T. E., "A Method for Study of Shrinkage and Its Distribution in Castings," *Transactions*, American Foundrymen's Society, 40, 201-216 (1932).
2. Kura, J. G. and Lang, R. M., "Mechanical and Physical Properties of Three Low-Shrinkage, Copper-Base Casting Alloys"; Simmons, W. F. and Kura, J. G., "The Creep Properties of Three Low-Shrinkage, Copper-Base Casting Alloys," *Proceedings*, American Society for Testing Materials, 58, 775-811 (1958). In Fig. 5 of the paper on mechanical properties, the hardness curves for the 80-10-10 and 85-5-5-5 were inadvertently interchanged. Fig. 5 of the present article presents the correct hardness data.

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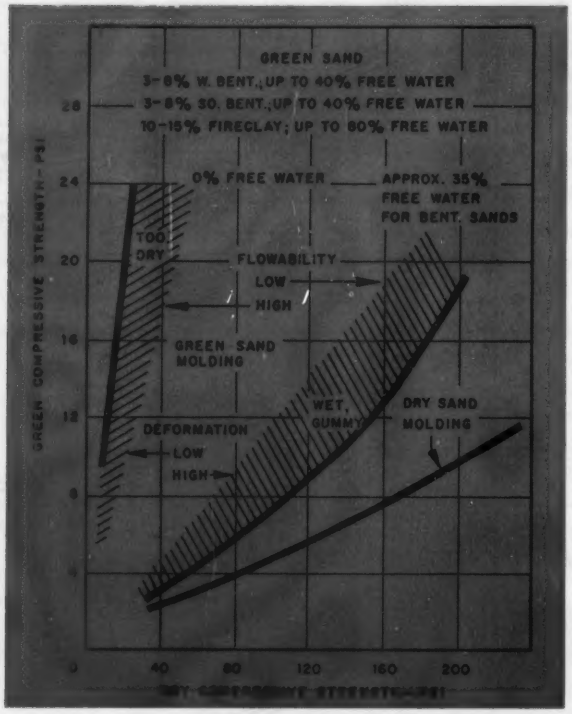
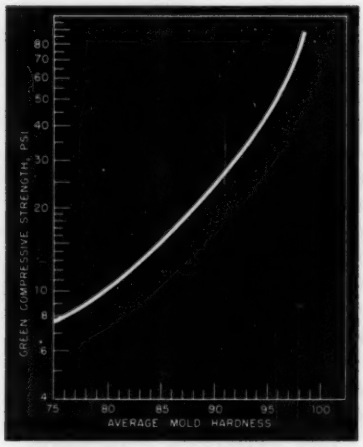


Fig. 1—Chart shows the effect of moisture content on clay-saturated sands

Fig. 2—Curve shows the relationship of green compression strength to mold hardness in clay-saturated sands



How Molding Sand Moisture Affects

CASTING QUALITY

Variable factors in molding sand produce important changes in casting quality. This article presents the results of a study of moisture content and the effects it has on properties of molding sand

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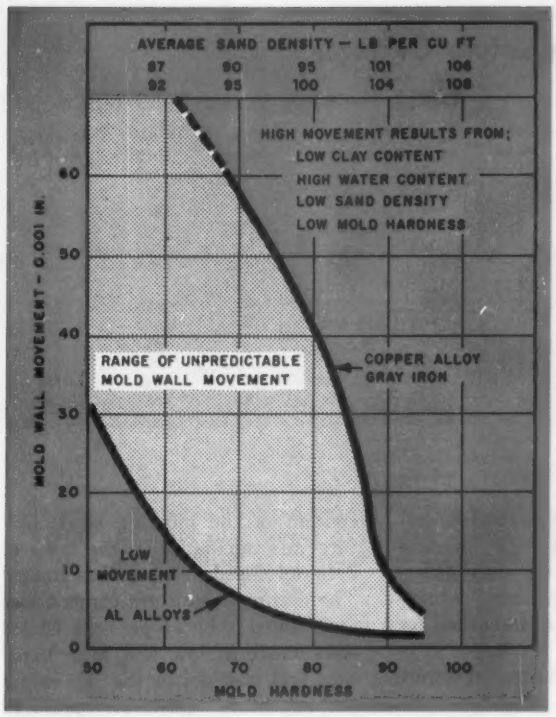
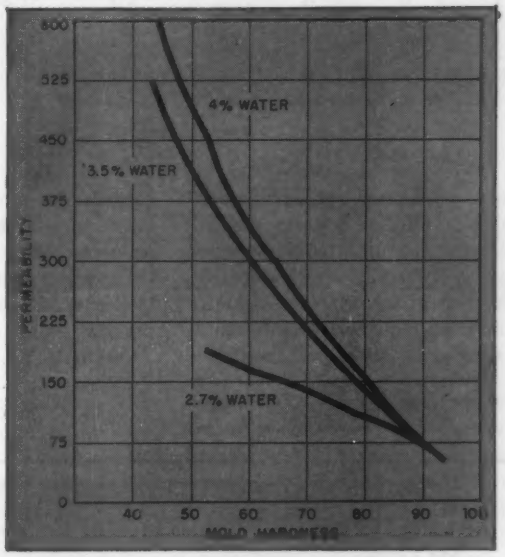


Fig. 3—Effect of mold hardness on mold wall movement caused by aluminum, copper-base alloy, and by gray iron in molds which were made of 89 AFS fineness, four-screen sand, bonded with 5-15 per cent southern bentonite and with 2.5-6.6 per cent water

Fig. 4—Chart gives the permeability readings at a number of mold hardnesses for sand mixes which were prepared with three different moisture contents



● MANY FOUNDRIES encounter a wide variation in casting quality not only from day to day but within one day. Several variable factors in molding sand are responsible. To demonstrate the influence of only one variable, this article will discuss what happens when moisture content is varied.

Moisture can change physical properties of sand radically. Fig. 1 shows the effect of moisture on clay-saturated sands. The drier the sand the harder it rams and the lower the dry compression strength. The wetter the sand the lower the green strength and the higher the dry strength. These statements hold true if the same ramming energy is used in both cases. Flowability and deformation change with moisture variations.

Fig. 2 relates green compression strength with mold hardness. Investigators have demonstrated that in a clay-saturated sand green strength remains the same at a given mold hardness even though moisture content is varied.[1] Of course, it takes greater ramming energy to achieve the same mold hardness as the sand becomes wetter.

Data in Fig. 3 show the effect of mold hardness on mold wall movement, or to state it another way, casting swell or dimensional change. The curve on the right is for copper alloys and iron, the one to the left is for light metals such as aluminum. Note how rapidly mold wall movement decreases with changes in mold hardness to the point where at 95 mold hardness wall movement is down to 0.005 in., which in many cases is within machining tolerances.

Experimental Facilities—Castings were prepared under controlled foundry routine to demonstrate these factors. The work was done in our small laboratory foundry. It consists of a sand system that feeds a weigh hopper above a commercial size muller. The muller discharges into a bucket elevator that carries the sand to a hopper above a jolt-squeeze molding machine. Molds made on the machine are set on a conveyor for movement to a pouring station. Metal is supplied by a high frequency furnace with capacity of 30 lb of iron per heat. An optical pyrometer is used to determine metal temperature.

Molds were made with a step block pattern mounted on a non-shift plate. Corner-opening flasks, widely used in production, were used for the test work. The casting was risered with a no-grind riser, which breaks off cleanly, leaving little grinding to be done. It functions just like a normal riser.

The sand used had a screen distribution as follows:

Mesh	%	Additions	%
10-40	4 max		
50	10-15	So. Bent.	3
70	25-35	W. Bent.	3
100	25-35	D4 seacoal	1
140	10-15	Cellulose	1
200-pan	6 max		

This formula is one we have used for years when establishing a synthetic sand practice in foundries. It

Properties of Sand Mixes with Varying Moisture Contents

TABLE I—3.5% Water Sand Mix

No. Rams 2-lb wt	Mold Hardness	Green Perm	Green Str, psi	Dry Str, psi	Sand Sample Wt, grams
1	45	515	1.5	10.6	120
2	52	400	2.1	14.9	125
3	58	315	2.8	17.2	129
4	65	270	3.2	21	132
7	73	195	4.6	29	139
14	83	132	7.4	44.6	147
14-lb wt					
1	81	135	7.0	48.8	146
2	87	98	9.7	67.8	153.5
3	89	80	11.2	78.0	157
5	91	64	13.9	92.0	161.5
7	93	55	16.1	108.6	164
10	94	48	18.6	118.2	167

TABLE II—4.0% Water Sand Mix

No. Rams 2-lb wt	Mold Hardness	Green Perm	Green Str, psi	Dry Str, psi	Sand Sample Wt, grams
1	44	600	1.7	18.3	118
2	52	480	2.1	25.8	122
3	58	375	2.7	32.0	127
4	64	310	3.2	40.2	132
7	74	225	4.6	56.1	137
14	81	143	6.9	89.9	147
14-lb wt					
1	80	148	6.7	95.4	145.5
2	86.5	105	9.4	135.6	153
3	89	80	11.4	164.1	157.5
5	92	60	14.3	198	161
7	93	52	15.9	228.3	164
10	94	46	18.4	253.8	167

produces good gray iron castings on initial runs and is easy to control on subsequent remulling of the sand as routine operations are established. To further guarantee no variation in sand from mold to mold, the sand was used only once and then discarded. Thus, with the sand formulated on a weighed basis, mulling time constant, and the only difference being water content, a controlled sand mix was established for making molds.

Normal, or optimum, moisture content of the molding sand mixture was calculated on the basis of data developed in a previous study.[2] The optimum moisture content was determined to be 3.5 per cent. Molds were made at low and high hardness and checked in the laboratory to establish physical property curves.

To establish a ramming method, we made molds first with the sand at the normal 3.5 per cent moisture content. One mold we deliberately rammed soft; the next mold was rammed as hard as possible on our 12-in. molding machine. Then, by using the AFS standard rammer and a mold hardness tester, we determined the amount of force (number of rams) required to develop mold hardnesses to match those of the soft and hard molds. We used the same number of rams with the drier sand (2.7 per cent H_2O) and the wetter sand (4 per cent H_2O). As expected, the drier sand had higher mold hardness and the wetter sand was softer.

This procedure was used to duplicate normal foundry methods as closely as possible. In an operational foundry, molding routine is not changed with each change in sand quality. Foundry standards are set on the number of jolts and the amount of peening, hand ramming,

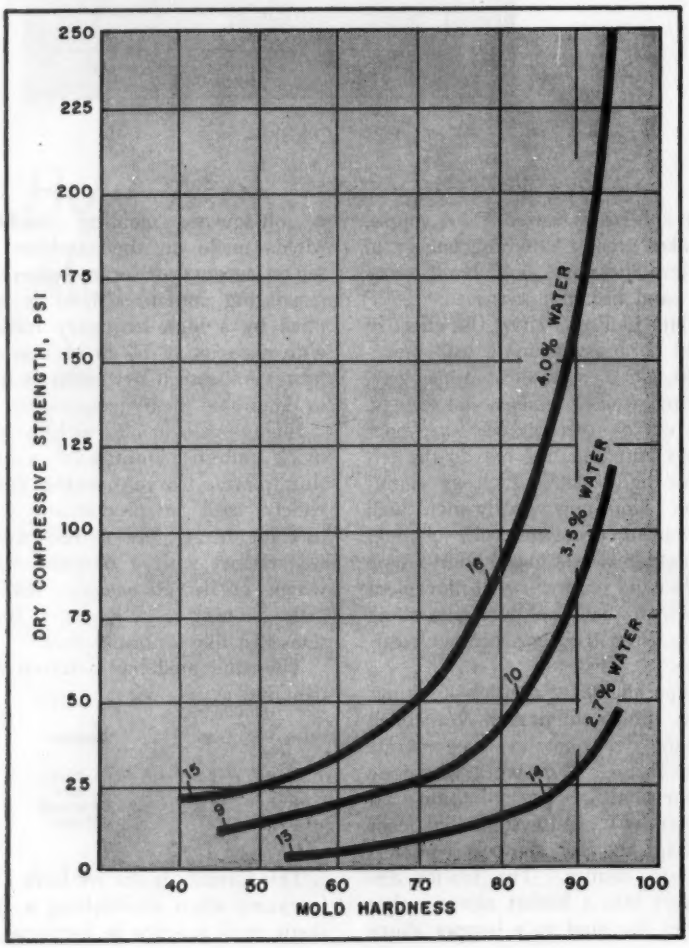


Fig. 5—Chart shows how dry compressive strength is lowered as moisture is reduced. Strengths shown at various mold hardnesses

TABLE III—2.7% Water Sand Mix

No. Rams 2-lb wt	Mold Hardness	Green Perm	Green Str, psi	Dry Str, psi	Sand Sample Wt, grams
1	53	192	1.8	3.5	135
2	63.5	161	2.6	4.7	138.5
3	69	145	3.3	7.6	142
4	73	128	4.1	8.0	145
7	78	112	5.7	14.9	148
14	87	85	8.6	21.4	153
14-lb wt					
1	85	92	7.7	19.5	151
2	90	72	10.9	23.8	157.5
3	91	64	12.6	28.1	159
5	93	54	15.2	36.9	162
7	94	48	17.5	39.7	164.5
10	95	39	20.1	45.2	166.5

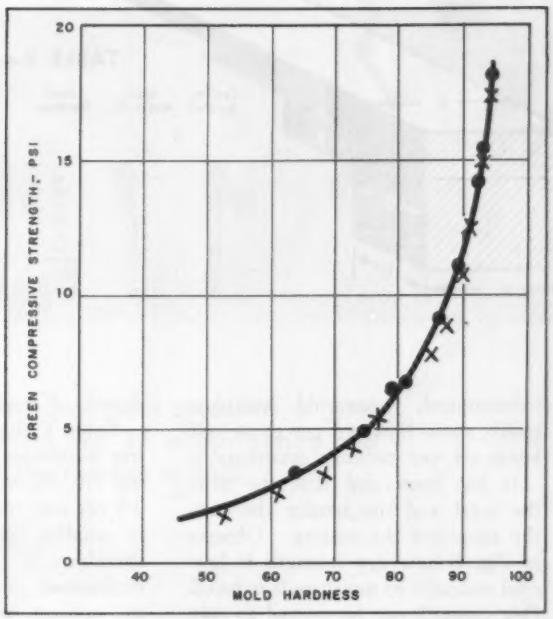


Fig. 6—Green strength curve emphasizes that green strength does not vary greatly as moisture changes if sand is rammed up to the same mold hardness

and squeezing which are performed.

Test molds deliberately were rammed soft and hard at the low end and at the high end of the range generally found in production squeezer operations. The purpose was to show the marked differences that can occur in practice. Test results were based on the following castings produced in sand molds having the water contents and mold hardnesses listed:

	—Soft Ram—		—Hard Ram—	
Water, %	M. H.	Cstg. No.	M. H.	Cstg. No.
3.5	46	9	83	10
4.0	41	15	79	16
2.7	54	13	86	14

If the desired moisture content is 3.5 per cent, then the range of 2.7 per cent to 4.0 per cent is about average for what would be found in a shop.

Molds were poured with metal at 2640° F. Since the lip of the pouring ladle was in a fixed position and the molds were on a conveyor, pouring height was the same. Also, the metal used consisted of remelted gates, risers, and castings originally produced within an hour on one squeezer floor of a local foundry. The carbon content was 3.35 per cent and silicon, 2.10 per cent.

Great care was taken in conducting this investigation to establish a uniform sand preparation, molding method, metal temperature, and pouring technique. Molds were shaken out at the same time interval after pouring, and castings were cleaned with a powered wire brush to prevent altering casting surfaces which might occur with blast cleaning.

Here Are the Results—Table I shows physical properties of the sand mix at 3.5 per cent moisture over a wide range of mold hardnesses. The first column shows the number of rams and the weight used on the rammer to achieve the mold hardnesses. Notice the range of permeabilities from 515 to 48, green strength from 1.5 to 18.6 psi, and dry compression strength from 10.6 to 118.2 psi. What properties do you want? That depends on how the sand is rammed.

Properties of the sand containing 4.0 per cent moisture are shown in Table II. Notice how the permeability and dry compression strength show the greatest change. Yet, moisture content is raised only ½ per cent. Certainly, this much variation easily could be expected in foundry operations unless moisture was controlled carefully.

The properties of the 2.7 per cent moisture content sand shown in Table III, show a great reduction in dry strength and slight increase in green strength as compared to that of the 3.5 per cent moisture sand.

Fig. 4 charts permeability readings at various mold hardnesses for sand mixes of the three different moisture contents. At 90 mold hardness the readings are essentially the same. The sand at this point is reaching maximum compaction. The test castings show that the degree of surface smoothness or roughness follows the variation in permeability. The castings poured in the

TABLE IV—Analysis of Mold and Test Casting Characteristics

Casting Number	Mold Hardness	Mold Water, %	Casting Weight, lb	Dirt	Penetration	Swell	Surface*	Riser Shrink**
9	46	3.5	13.2	No	Yes	Yes	F	4
10	82	3.5	12.3	No	No	No	S	1
13	54	2.7	12.7	Yes	Scab	Low	S	5
14	86	2.7	12.5	Yes	Scab	No	S	3
15	41	4.0	13.0	No	Yes	Yes	R	6
16	79	4.0	12.4	No	Yes	Low	F	2

*S=Smooth; F=Fair; R=Rough
**1=least riser shrink; 6=most riser shrink

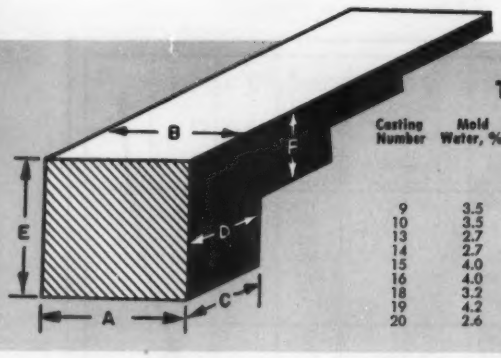


TABLE V—Dimensions of Pattern and Test Castings

Casting Number	Mold Water, %	Mold Hardness	Dimensions, in. A	B	C	D	E	F	Casting Weight, lb
			3.888	3.970	PATTERN 1.905 CASTINGS	DIMENSIONS 1.925 DIMENSIONS	3.687	1.687	
9	3.5	46	4.025	4.160	1.950	1.970	3.682	1.685	13.2
10	3.5	82	3.884	3.994	1.852	1.893	3.674	1.680	12.3
13	2.7	54	3.920	4.034	1.903	1.915	3.665	1.678	12.7
14	2.7	86	3.895	4.048	1.891	1.917	3.690	1.698	12.5
15	4.0	41	4.055	4.151	1.955	1.966	3.702	1.687	13.0
16	4.0	79	3.912	4.029	1.915	1.919	3.698	1.702	12.4
18	3.2	90-93	3.882	3.981	1.896	1.941	3.678	1.688	12.4
19	4.2	90-93	3.897	4.008	1.910	1.923	3.696	1.693	12.5
20	2.6	90-93	3.893	3.988	1.897	1.925	3.688	1.687	12.4

soft-rammed, open-void structure molds show how we get those odd knots on our castings occasionally.

It has been said that the drier the sand and the harder the ram, the smoother the casting. Observe in Fig. 5 how dry strength is lowered radically as moisture is reduced. Dry strength can be related to cuts, washes, and dirty castings. We did not get dirty castings at 3.5 per cent and 4.0 per cent moisture but did at the 2.7 per cent moisture level. How much dry strength is needed? The level of strength at which casting No. 14 was made, about 20 psi, was not enough. Possibly if mold hardness had been 95 with 45 psi dry strength, it may have been sufficient.

TABLE VI—Effect of Flask Size and Squeezer Cylinder Diameter on Mold Hardness and Mold Wall Movement

(12-in. squeeze cylinder at 90 psi, approximately 10,000 lb pressure)

Flask Size, in.	Pressure psi	Mold Hardness	Mold Wall Movement, in.
12 x 16	52	82	0.035
15 x 15	45	80	0.042
12 x 20	42	79	0.043
14 x 18	40	78	0.045
16 x 20	31	75	0.055
20 x 20	25	70	0.060
	With 15-in. Squeeze Cylinder		
12 x 16	80	90	0.008

Fig. 6 shows the curve of green strength. This emphasizes that green strength does not vary greatly as moisture varies if the sand is rammed to the same mold hardness.

Test castings, identified by number, are analyzed in Table IV. Notice the variance in casting weight and the defects observed. Casting No. 10, produced in a hard rammed sand mold of normal moisture content, was the lightest weight and had no dirt, penetration, or swell defects. The surface was smooth, and the riser showed the least shrink of those examined.

Table V shows variations in casting dimensions. Notice that casting No. 10, made in hard rammed, 3.5 per cent moisture sand, is slightly smaller than the pattern and, therefore, is closest to the correct dimension. A shrink rule is used in making patterns because the casting should be smaller than the pattern.

Table VI shows the effect of flask size and squeezer cylinder diameter on mold hardness and mold wall movement. Data in the table are relative only, because many factors are involved in the making of a mold. Here, only squeeze relationship is shown without consideration of flask depth or jolting of the mold. The data, however, are relative to machine power. Notice how squeeze pressure per square inch of plate surface area is reduced as flask size increases. How often is this fact considered when flasks are changed on squeezer machines in a foundry?

Supplementary Work — Additional test castings were produced in molds with hardnesses in the 90 to 93 range. The molds were made on a 16-in. jolt squeeze machine, and sand mixes were at three moisture levels. Physical properties of the sand mixes are given in Table VII. Dimensions of the test castings are given in Table V.

Dimensions of all the test castings were close to the pattern dimensions. Thus, again it is shown that high mold hardness does produce castings to better accuracy.

Conclusion—The importance of careful attention to molding methods is emphasized by these test results which showed wide variations in castings with only slight variations in molding sand moisture content under controlled laboratory conditions. Also, laboratory test work should be done with sand mixes and molding methods used in foundries in addition to work in accordance with standard test procedures of the American Foundrymen's Society.

Test work might be directed to relating the physical property curves of green strength, green shear strength, permeability, and dry strength to mold hardness variations. With that data available and closely controlled water content of the molding sand, a simple mold hardness test at the molding line would indicate the type of casting to expect from a given mold.

TABLE VII—Properties of High Molding Pressure Sand Mix

Casting Number	Mold Water, %	Mold Hardness	Green Perm	Green Str., psi	Dry Str., psi
18	3.2	92	56	16.5	109
19	4.2	91.5	60	14.3	198
20	2.6	93	50	17.7	45

In molding, proper size flasks should be used on molding machines; oversize flasks should not be used. Proper mulling time is important in sand preparation. Shortening the mulling cycle makes necessary the use of excess clay in the sand mixture, with resultant complications in sand control. Sand temperature also is important; sand properties vary with the temperature.

The best castings are made in fully mulled, cool sand mixes molded with flasks, patterns, and molding equipment of correctly matched sizes.

REFERENCES

1. R. W. Heine, E. H. King, and J. S. Schumacher, *Transactions*, AFS, 1957, Vol. 65, p. 123.
2. R. W. Heine, E. H. King, and J. S. Schumacher, *Transactions*, AFS, 1957, Vol. 65, p. 118.

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RISERING of Steel Castings

Correct risering of steel castings involves two basic problems — riser location and riser dimensions. This article, No. 11 in our gating and risering series, is the first of three on the risering of steel

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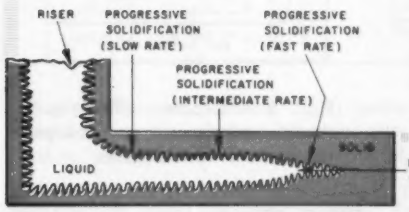

Fig. 1—Schematic representation shows how directional solidification arises from variations in rates of wall growth from the surface to the center line of a cast section

● TWO BASIC problems involved in the correct risering of steel castings are (1) riser location and (2) riser dimensions.

A riser can feed a cast section to complete soundness for only a limited distance, depending on the geometry and thickness of the section. Consequently, risers must be located sufficiently close together so that all points of the casting are within the feeding range of a riser; if risers are too far apart, internal shrinkage will develop within the casting.

A riser must have dimensions that prevent it from freezing until after the casting has solidified, and it must have sufficient volume so that it can supply all of the liquid feed metal required by the casting during its solidification; if the riser is inadequately dimensioned, shrinkage will be present in the casting beneath the riser contact. Thus, shrinkage in the casting immediately beneath the riser indicates that the riser is too small, either in diameter or height or both. Shrinkage in the casting at a location away from the riser contact indicates that either the riser locations must be changed or additional risers employed. The latter type of shrinkage is not visible to the eye and must be detected by radiographic or ultrasonic methods.

It is, of course, economically desirable to use the minimum number of risers of the smallest size in obtaining a sound casting. Obviously, if one is liberal in choosing the size and number of risers to be employed on the casting, he can, with no appreciable knowledge on his part, be certain to have a sound casting; yields will be low, however, and the cost of the casting high. There are techniques which can be employed to increase riser efficiency, thereby permitting smaller risers to be employed without causing under-riser shrinkage. There are also foundry procedures which increase the riser feeding range to permit a reduction in the number of risers needed to com-

Fig. 2—This 1-in. test strip which was removed from a plate casting shows severe center-line shrinkage

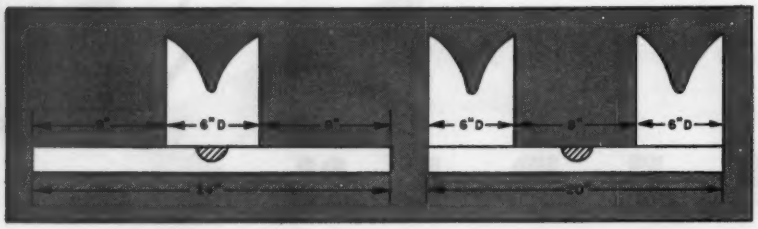

Fig. 3—Longest 2 in. thick, 8 in. wide plate castings which can be made sound by risers at the locations indicated

pletely feed the casting. Too, there are means of molding riser contacts to permit them to be removed with a minimum amount of labor. The application of these cost-reducing features to the risering of castings without sacrificing casting quality is an indication of good risering procedure.

Plate and Bar Sections — The basic requirement for soundness in a casting is the presence of proper temperature gradients to insure directional solidification. If such gradients are present, risers can promote feeding for great distances; otherwise, feeding will be negligible. Thus the riser is primarily a reservoir of molten metal with great potential feeding ability, which is governed by thermal conditions determined not only by the riser itself but also by other factors, such as the thickness of the casting and the rate of heat extraction by the mold.

Directional solidification arises from variations in rates of wall growth, commonly termed progressive solidification, from the surface to the center line of a cast section, as shown in Fig. 1. Fast wall growth at locations away from the riser and an increasingly slower wall growth at distances nearer the riser cause final solidification at the casting center line to move toward the riser. This is directional solidification. The importance of directional solidification to feeding is that a tapered, liquid channel condition is developed within the casting to provide for the unhindered flow of liquid feed metal from the riser into the casting.

Since a casting is comprised of a series of simple shapes joined together, quantitative studies on feeding range were conducted at the Naval Research Laboratory[1, 2] to determine feeding range in simple bar and plate shapes. Specifically, the studies were made to determine the maximum length of simple plate and bar sections of different thicknesses which could be fed to complete soundness as determined by radiographic examination, in the transverse direction, of 1-in. strips removed from these castings. Fig. 2 shows a test strip containing center-line shrinkage.

Tests also were made to determine how these resulting feeding range figures were modified in cases where two or more plate sections of different wall thicknesses were joined.[3] This work also included thermal analysis studies, which were made to correlate the condition of soundness in the castings with the temperature gradients which were developed during solidification. This was accomplished by locating platinum, platinum-rhodium thermocouples along the center line of the casting at various locations from the casting extremity to the riser.

Test Results—Semicircular plates having thicknesses of from ½ to 4 in. were employed in the feeding range studies for cast steel plates. It was found that a plate section could be fed to complete soundness, as measured from the circumference of the riser to the edge of the plate, for a distance of 4½ times the casting thickness (4½T). As the radii of the plates were increased above this critical size of 4½T, radial shrinkage developed in the casting near the riser, but a zone equal to approximately 2½ times the casting thickness at the rim of the casting always remained sound.

With further increases in radii, the area of shrinkage and the severity of shrinkage increased, but the width of the sound rim zone remained unchanged. This sound

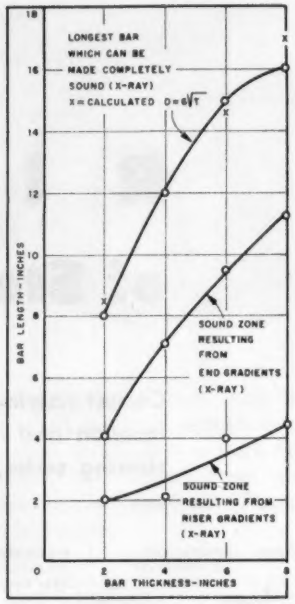

Fig. 5 — Graphic illustration shows soundness relationships for bars of various sizes.

region resulted from the chilling effect of the casting edge. Thus it is apparent that the chilling effect of casting extremities is a major factor in promoting casting soundness. Since this distance is equal to 2½T, the remaining 2T distance can be considered to have been made sound as a result of directional solidification originated by the riser. It is apparent that the casting edge effects are more influential in promoting directional solidification than is the riser itself, and wherever possible these edge effects should be utilized to extend directional solidification and feeding range.

Fig. 3 illustrates the results of tests to show the longest 2-in. thick 8-in. wide plate castings which could be made sound with the riser locations indicated. It can be noted that one riser, situated at the center of the plate so that it feeds toward the edges, can feed a longer casting to completed soundness than two risers placed at the casting edges where end effects are obliterated. Thermal studies corroborate the results obtained by x-ray examination of the test plates.

Fig. 4 shows the temperature gradients at different time intervals along the center line of 2-in.-thick semicircular castings having radii of 12, 14, and 16 in., respectively. Since half of the 6-in. diameter

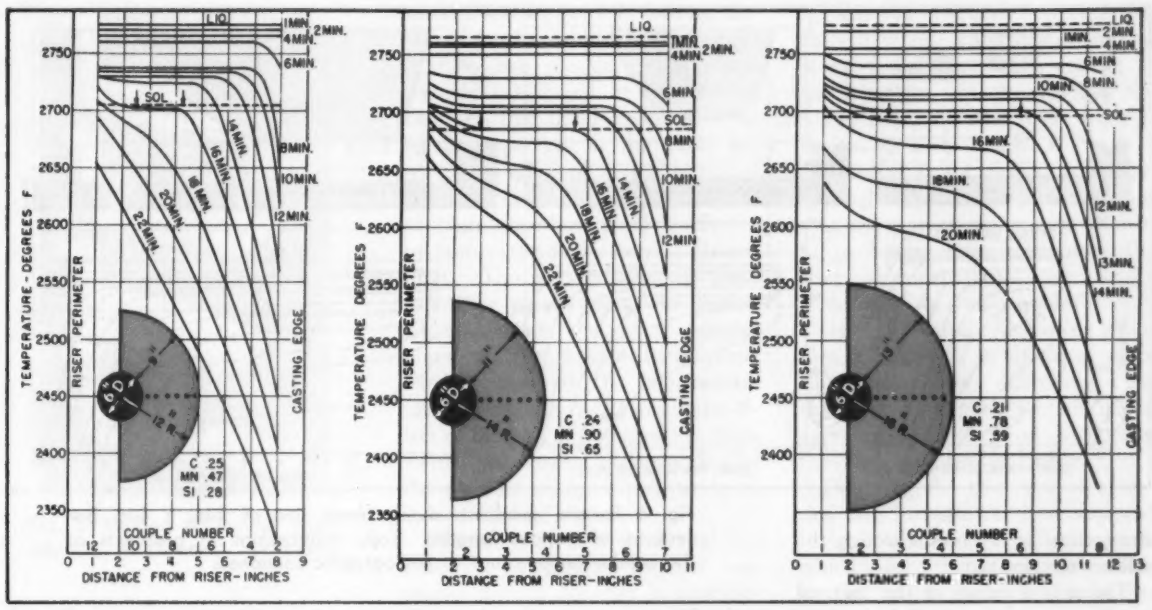

Fig. 4—Thermal gradients along center line of 2 in. thick semicircular castings at various time intervals after pouring. Length of isothermal zone increases with casting radiuses of 12, 14, and 16 in., respectively

riser extends over the plates, the actual distance to be fed in each case is 3 in. less than the radius. X-ray examinations show that the smallest of these castings is sound; the intermediate contains slight shrinkage; and the largest, severe shrinkage.

It will be noted from these temperature curves that the center planes of the casting pass through the liquidus temperature within a minute after pouring without measurable thermal gradients being present. Gradients, however, are soon established at each extremity of the casting. The risers, because of their mass and because of the re-entrant angle which they form with the casting, reduce the rate of heat extraction, but the casting edges, because of the added surface area which they present, increase the rate of heat extraction.

As the casting cools and freezing progresses, the riser gradients and the casting edge gradients progress toward each other in an attempt to effect a junction. This occurs at the expense of the central uniform-temperature zone. If the casting is sufficiently short, the central isothermal zone will be eliminated before the solidus temperature is reached, and the edge zone will join the riser zone to form a continuous gradient over the entire casting to assure directional solidification and soundness. The effect of increasing plate radii is to increase the length of the isothermal zone which remains when the solidus temperature is reached. These zones are indicated by arrows on the curves of Fig. 4 and illustrate this point. A maximum gradientless zone equal to the casting thickness can be tolerated without causing shrinkage.

Feeding Bar Castings—Bar castings with cross sections up to 8 x 8 in. can be fed to complete soundness for a distance equal to six times the square root of the thickness ($6\sqrt{T}$) as measured from the circumference of the riser to the end of the bar. Radiographic examination of test castings indicated that about two-thirds of the sound zone resulted from casting end gradients, and the remaining distance is sound because of gradients produced by the riser. This again emphasizes the relative importance of casting end gradients in developing directional solidification.

These effects are shown graphically in Fig. 5. It will be noted from this figure that the sum of the end and riser zones does not equal the $6\sqrt{T}$ distance which can be made completely sound. This is due to the fact that, when shrinkage develops within a casting, it tends to spread by an internal hot tearing mechanism into the hot riser zone, which would normally have been sound. This phenomenon was also noted in the case of the plate castings, where it was found that shrinkage often extended to the riser periphery.

The feeding range in bars in sections up to 6 x 6 in. was found to be the same whether the casting was made in the vertical or horizontal plane; however, a vertically cast bar having an 8 x 8-in. cross section can be fed to complete soundness for a distance of 21 in., compared with 16 in. for the same bar in the horizontal plane. In large sections, apparently, convection currents develop to accentuate thermal gradients and extend feeding range.

The thermal conditions required to produce soundness in bar shapes are different from those required in plate sections, as indicated in Fig. 6A, B, and C. This figure shows the gradients at various times after pouring along the center lines of bars of 4 x 4-in. cross section. Fig. 6A represents the longest bar which can be made completely sound as determined by radiography. Fig. 6B and C show the thermal condition in sections which are longer than the critical length and contain shrinkage. It may be noted from Fig. 6B that shrinkage occurred despite the fact that measurable gradients existed over the en-

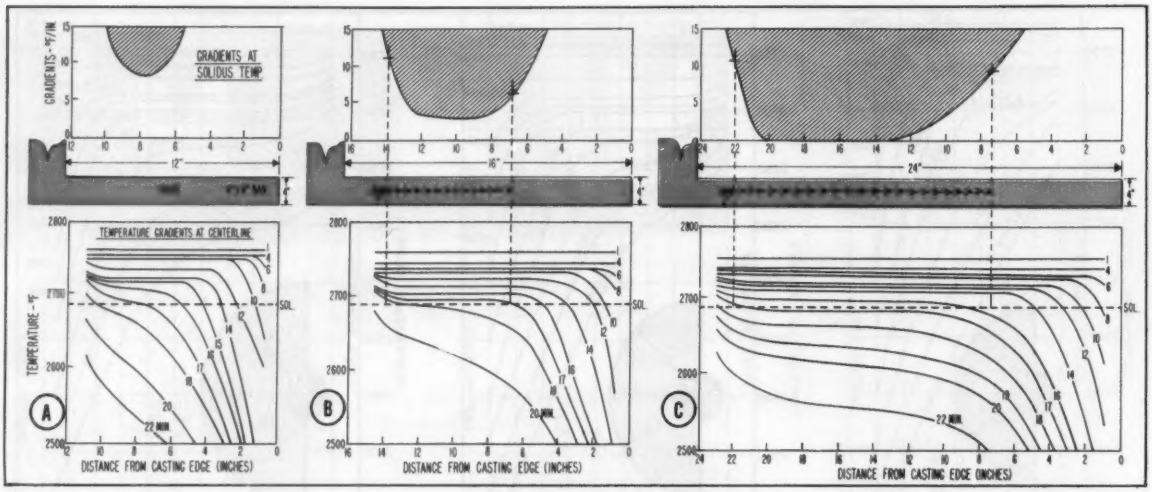

Fig. 6—Bottom, gradients along center line of 4-in. x 4-in. bar sections of various lengths. Top, relationships of gradients at the solidus temperature to radiographic soundness

tire section as it passed through the solidus temperature.

The actual values of the thermal gradients, as determined by the tangent slope method, at the time the various center-line positions of the casting reach the solidus temperature, are plotted above the thermal curves. The resultant curves of gradient values are related to the sound and unsound zones determined radiographically by the schematic illustrations at the center of the figures. It may be noted that the point of transition from soundness to shrinkage corresponds to gradients of from 6 to 12° F per inch. Shrinkage develops when the steepness of the thermal gradients at the critical last stage of solidification fall below this range.

Effects of Geometry — Comparisons of the behaviors of plate and bar castings provide important information as to the effects of geometry on the thermal gradient conditions required for feeding. Even though directional solidification migbt exist, geometry effects determine whether the degree of directional solidification is sufficient to produce soundness. An explanation for this is provided by consideration of the differences of the course of wall growth in plate and bar sections which affect last-stage feeding conditions.

Wall growth in any section occurs by the movement of a mushy zone from the casting surface toward the center line. This mushy zone consists of solid dendrites, which are pine tree-like structures, surrounded with liquid metal. Thus, feed metal from the riser must not only flow longitudinally along the casting, but it must also flow laterally to feed the interstices between the solid dendrites. Fig. 7 illustrates schematically the conditions of solidification in plate and bar castings at temperatures slightly above the solidus temperature. In the case of plate sections, longitudinal liquid flow occurs along a plate-like channel, with lateral feeding required in only two directions. In the case of bar sections, longitudinal flow must take place along a single rod-like channel with lateral feeding required in a full 360-degree sector.

The increased resistance to liquid flow along the rod-like channel of the bar section and the greater lateral area which must be fed by this channel require steeper longitudinal gradients to provide a more open condition for feeding. The steeper gradients required for bar sections thus necessitate an overlap of the riser and end gradients rather than a simple joining, which is all that is required for plate sections.

Joined Sections — Studies[3] made on the feeding distances in joined plate sections of different thicknesses show that the rule of $4\frac{1}{2}$T which applies to separately cast plates requires modification to apply to joined sections. In these studies, plate sections of 1, 2, 3 and 4 in. thickness were joined together in various combinations, as illustrated in Fig. 8. The length of each component of the casting was systematically varied in 1-in. steps to determine the maximum length which could be made sound. The riser was always located on the heavy section so that the thinner sections were fed by the heavy section, which, in turn, was fed by the riser. The width of these test castings was equal to five times the thickness of the heaviest section.

It was observed that the maximum feeding distance in the smallest end plate of a given thickness increases as the thickness of the larger plate adjoining it is increased. For example, a 1-in.-thick plate attached to a 2-in. plate can be made sound for a distance of $7\frac{1}{2}$ in., but when it is attached to a 4-in. plate, it can be made sound for a distance of approximately 13 in. Furthermore, the feeding distance in all of the thin end plates, regardless of their thickness, is constant when joined to a parent plate of given thickness. For example,

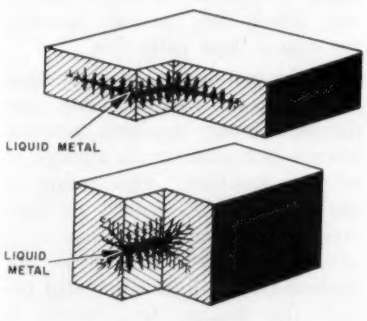

Fig. 7—Schematic illustration of channel conditions for feed metal flow in plate and bar sections

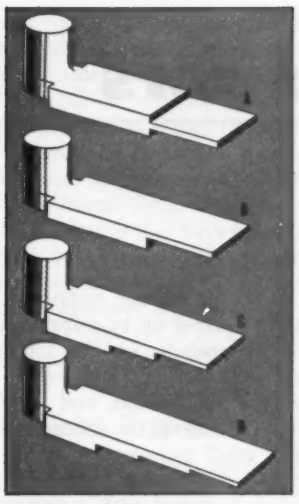

Fig. 8—Method of joining plate sections of different thicknesses

a 1, 2, or 3 in. plate joined to a 4-in. plate is made sound for a distance of 13 in. Thus feeding distance in the thinner plate is strictly a function of the thickness of the parent plate to which it is attached.

The feeding distance in such plates is expressed by the formula: $D_l = 3\frac{1}{2}T_h$ where D_l is the feeding distance in the light section in inches and T_h is the thickness of the heavy section in inches. It is apparent that the feeding distance in sections joined to a heavier parent section can be greater than would be the case if the light section were cast separately.

This increased feeding distance is countered in part by a decrease in the feeding distance in the heavier section below the $4\frac{1}{2}T$ value. It was noted, for example, that as thickness of the parasite plate attached to the 4-in. section is increased from 1 to 2 to 3 in., the feeding distance of the 4 in. section decreases in turn from 13 to 10 to $7\frac{1}{2}$ in. This is due, of course, to the fact that as the relative thickness of the parasite plate increases, the chill edge effect in the heavier section is decreased proportionately.

A formula which predicts feeding range in the heaviest of a series of joined sections is: $D_h = 3(T_h - T_l) + 4\frac{1}{2}$, where D_h is feeding distance in the heavy plate in inches, T_h is thickness of the heavy section, and T_l is thickness of the light section in inches.

When three or four or more plates of dissimilar lengths and thicknesses are joined, feeding distances in the heaviest and lightest sections are as shown in these formulas; it should be emphasized, however, that the T values in these formulas pertain to the plate immediately adjacent to the heavy or light plate. The feeding distance in an intermediate plate is affected by both plates immediately adjacent to it. The heavier adjacent plate acts as a parent plate; the lighter adjacent plate acts as a parasite plate to the intermediate plate. Feeding range in the intermediate plate is, therefore, the resultant effect of the parent plate, which tends to increase feeding distance, and of the parasite plate, which tends to reduce feeding distance.

Experimental data show that the following empirical formula expresses feeding distance in intermediate plate sections: $D_m = 3.5 (T_h - T_l)$, where D_m is feeding distance in the intermediate section in inches, T_h is thickness of the parent plate adjoining the intermediate plate, and T_l is thickness of the parasite plate adjoining the intermediate plate.

According to the formula for feeding parasite sections, $D_l = 3\frac{1}{2}T_h$, the feeding distance in the lighter sections exceeds the $4\frac{1}{2}T$ value obtainable in separately cast plates when the T_h/T_l ratio exceeds 1.4, which is approximately that existing in the 4 to 3 in. plate combination. Thus, under such conditions, the parent plate is more effective in promoting feeding than is a conventional round riser. This is ascribed partially to the re-entrant angle, which is continuous along the width of the casting at the junction. In the case of the round riser, the re-entrant angle is limited to a small area.

Another factor providing longer feeding ranges in the small plates is that the parent plate stays molten for a longer time than does the riser. A conventional riser usually is designed to stay liquid for only a short time after the casting solidifies, but, as will be discussed more completely later, increasing the thickness of a plate section has a very marked effect on increasing the time required for freezing.

Doubling the thickness of a section will increase the time required for solidification by a factor of 4, which means that it must stay within the liquidus-to-solidus temperature range for a much longer period and is, therefore, able to extend thermal gradients for a greater distance into the parasite section. This is illustrated in Fig. 9, which shows the gradients developed in a separately cast 1-in.-thick plate and in the same plate which is joined to a 3-in.-thick plate.

(To be continued next month)

References

1. H. F. Bishop and W. S. Pellini, "The Contribution of Riser and Chill Edge Effects to the Soundness of Cast Steel Plates." *Transactions*, AFS, Vol. 58 (1950).
2. H. F. Bishop, E. T. Myskowski, and W. S. Pellini, "The Contribution of Riser and End Effects to the Soundness of Cast Steel Bars." *Transactions*, AFS, Vol. 59 (1951).
3. E. T. Myskowski, H. F. Bishop, and W. S. Pellini, "Feeding Range in Joined Sections." *Transactions*, AFS, Vol. 61 (1953).

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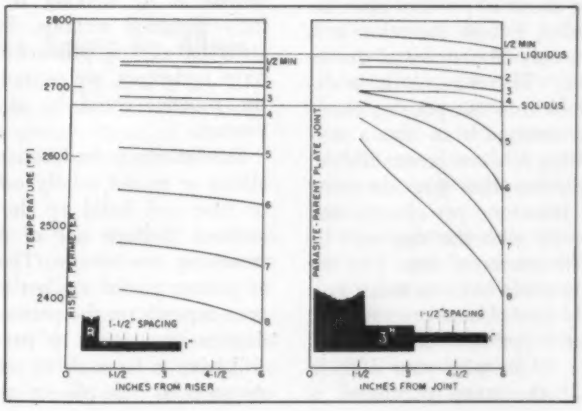
Fig. 9—Illustration shows thermal gradients developed in solidifying separately cast 1 in. thick plates that are adjacent to (left) a conventional riser and (right) a 3 in. thick parent plate



Questions and Answers

Melting rate variations and high fluxing agent additions cause slagging trouble . . . Sectional plaster mold method used for production of statues . . . Framework holds up the mold . . . Nonferrous fluxes . . . Aluminum bronze melting

Is Using Too Much Limestone

Lately the slag in our front-slagging cupola has been running thick and slow, and we will appreciate information on how to remedy the situation. Cupola is lined to 42 in. Bed is 48 in., metal charges weigh 1000 lb, and the coke splits 140 lb. Sixty pounds of limestone is placed on each charge. Air supply is 3500 cfm at 14 to 18 oz. Metal charges are composed of miscellaneous cast scrap with occasional motor blocks. Melting rate varies between 5 and 8 tons an hour.

With a variation of 60 per cent in melting rate, it is not unexpected that difficulty will be encountered in operation of your cupola. When melting at the rate of 5 tons an hour, coke consumption is 23.3 lb a minute, and when melting 8 tons an hour the consumption is 37.3 lb a minute. On the basis of 136.5 cu ft of air being required to burn 1 lb of coke, the amount of air needed for combustion will vary from 3180 cu ft a minute for the 5-ton rate to 5090 cu ft a minute at the 8-ton rate.

Thus, in one case the blower is supplying about 10 per cent more air than needed, but in the other it is supplying only 69 per cent of the requirement. Therefore, it is advisable to look into the pouring situation, and arrange it so that a uniform melting rate can be established.

You mention that you are using 60 lb of limestone per charge, and the difficulty with the slag may lie in that circumstance since you are employing about twice as much as is commonly used. Usual practice is to use about 3 per cent of the metal weight or 30 lb with your 1000-lb charge. If the scrap purchased is clean and free from rust, and the returns are abrasive blasted to remove the sand, the amount of limestone can be reduced. Use of the lowest amount of stone which will result in a suitable slag will reduce attack on the cupola lining and decrease the amount of slag generated.

Plaster Molding Procedure

We are making foundry matchplates by the plaster method and would like to know how individual molds are eliminated by continuity casting. We understand that in this method one section is poured, a metal strip is used to start another section, etc. Also we have tried a plaster-asbestos mix with some success, but information on that is meager.

Although the process of building up a plaster mold is employed to some extent in statuary production, it usually is used only where it is desired to preserve the original wax, plaster, etc., model or statue. Those contain numerous undercuts, and the only way the mold can be removed is by making it in carefully designed sections. Since patterns for casting production do not have undercuts, we cannot see how the practice could be of any advantage.

Briefly, the procedure is to set the statue or model solidly on a board or base and build up the mold in sections through use of plaster of troweling consistency. The amount of plaster placed against any given area depends on the presence of undercuts since joints or parting lines will have to be made at such points. As soon as the plaster air sets or hardens, the plaster section is removed, squared up by using a sharp knife or spatula, on the top, two ends and back. Bottom resting on the base will be flat, and the face side, of course, is not touched. Also, a few small grooves are cut in the top and end faces.

Piece is coated with a separating agent, placed back in position against the model, and another application of plaster is made on an adjoining area. Then that piece is removed, squared up except where the joint is made with the first piece, and of course only grooved on the top and one end. The procedure is continued until the whole model is covered. Then the pieces or sections are removed from the model in the reverse order that they were made, and reassembled for use.

The assembly is tied tightly together by any suitable means and turned so that the open side is up. It is filled with molten wax which is left for a time sufficient to build up a shell equal in thickness to that desired for the metal. The remaining liquid wax is poured out, and the cavity is filled with plaster to form a core. When the plaster has air set, the assembly is turned over, the ties removed, and the sectional mold removed. Wax sprues and risers are attached to the wax shell, and a number of nails and wires which penetrate through the wax shell into the core, are inserted to hold the core in position in the mold.

The assembly is set in a container of suitable size. Casting plaster mix is poured around it and allowed to air set; then the container is removed. Mold, wax shell, and plaster core are placed in an oven, open side down. The assembly is heated slowly to dry it thoroughly and melt out the wax. When that step has been accomplished, the mold is ready for filling with molten metal.

With reference to an asbestos-plaster mix, it might be mentioned

that a variety of combinations have been used at various times, but at present most of the material is a mixture of 4 parts by weight of alpha plaster and 1 part fibrous talc. Those may be purchased separately and mixed by the user, or purchased already mixed. Some mixtures containing asbestos that have been mentioned in the literature include 4 parts by volume plaster, 1 fireclay and 1 asbestos, and 2 plaster, 1 fireclay, 1 asbestos, 1 finely crushed firebrick, and 1 fine silica.

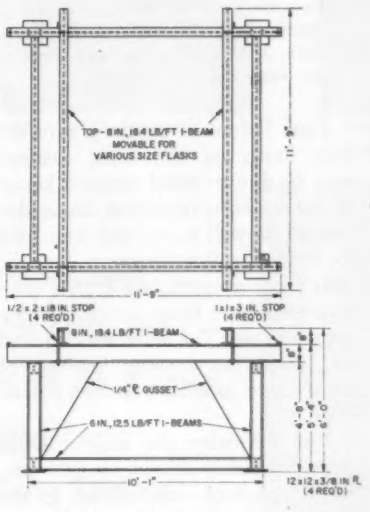
Developing Support for Mold

We have a problem which pertains to a safety hazard resulting from the necessity of examining, and sometimes repairing, the working surfaces of large molds while they are suspended from the crane. Some of these molds weigh 3 tons and use 6-ft square flasks; others are smaller and weigh less. We believe that the molds should be supported by some other means in addition to the crane to eliminate possibility of accidents, and are considering some kind of a metal saw-horse arrangement. We are limited in space, and cannot build a permanent installation. Also as indicated, the flasks vary in size. Have you any suggestions?

Although your idea of using metal saw-horses for supporting the molds appears to be a reasonable approach since they are simple to make, and can be moved about easily, it should be pointed out that unless certain precautions are taken, you still will have a safety hazard. Since at least two saw-horses must be used, care will have to be taken that their tops are reasonably level, that they rest solidly on the floor, and that they are spaced the proper distance apart. Also as the mold is being lowered into position, care must be taken to see that the horses are not shifted. Of course, some of those problems can be minimized by placing parallel bars across the tops of the horses, but the only positive method is to weld the horses together with such bars across the tops to insure solidity.

Therefore, instead of the saw-horse arrangement, we suggest that you employ one similar to that shown in the accompanying illustration, which was described briefly in the May, 1959, issue under the department heading, "How To Do It." Dimensions and particulars on materials are for flasks up to 140 x 200 in., but we suspect that for your 72 x 72 in. flasks, the steel sections might be somewhat lighter, although the proper section would have to be determined by use of suitable engineering formulas available in such handbooks.

We are in favor of the solid construction shown in the illustration, but the frame could be made in the form of two end pieces with the side members arranged with hinges and pins or latches so that they can be put together and taken apart as conditions warrant. With such an arrangement, the frames could be stored in a relatively small space. However, with this, as with any piece of equipment which must be handled, assembled and disassembled, constant vigilance will have to be exercised to insure that it is in good operating conditon and fastened together properly before it is placed in use.



Mold supporting framework

Fluxing Agents for Alloys

Can you supply us with any information on fluxes which are used in the pressure diecasting of aluminum, zinc, and magnesium base alloys?

A wide variety of fluxing agents are being used in the diecasting field. With all the alloys mentioned, chloride salts appear to be an essential part either as the active agent or for the purpose of lowering the melting point. Simplest combination is that used with zinc-base alloys; it is composed of 50 per cent ammonium chloride—commonly called sal ammoniac—and 50 per cent zinc chloride.

Fluxes for aluminum-base alloys mainly are mixtures of sodium or potassium chlorides and fluorides such as sodium, sodium silico, cryolite, etc. Examples include 50 parts by weight of sodium chloride and 25 parts each of sodium fluoride and potassium chloride; 50 parts sodium chloride and 25 parts each of sodium silicofluoride and potassium chloride; 85 parts sodium silicofluoride and 5 parts each of potassium chloride, sodium chloride, and cryolite; 50 parts potassium chloride and 50 parts cryolite; anhydrous aluminum chloride; anhydrous hexachlorethane, etc.

For magnesium-base alloys the fluxes are mixtures of chlorides of potassium, calcium, barium, magnesium with a small amount of calcium fluoride. Two of these are Dow Chemical Co. No. 230 and No. 310. The first contains 55 parts potassium chloride, 34 parts magnesium chloride, 9 parts barium chloride, and 2 parts calcium fluoride. The second is composed of 20 parts potassium chloride, 50 parts magnesium chloride, 15 parts calcium fluoride, and 15 parts magnesium oxide.

Melting Aluminum Bronze

We have an order for some aluminum bronze castings, and since we are not familiar with the alloy, can you supply information on melting and pouring temperature?

Lack of experience with aluminum bronze may lead to some difficulties since it contains an appreciable amount of aluminum. Like other copper-base alloys, it should be melted under slightly oxidizing conditions and as rapidly as possible to minimize gas absorption. Some foundries use covers and others do not, and certain proprietary materials are available which are claimed to provide satisfactory results.

Pouring temperatures vary from 2030° F for heavy to 2230° F for light castings, and the most suitable usually is the lowest which will fill the mold cavity completely and produce a sound casting.

Aluminum bronze should not be

stirred violently or any more than necessary since it breaks the aluminum oxide skin and carries it into the metal, resulting in inclusions in the castings. Lip of the crucible in pouring should be as close to the sprue as possible, and pouring must be steady so that the aluminum oxide envelope surrounding the metal stream is not broken. If that happens, aluminum oxide inclusions will appear in the castings.

In the mold cavity and gating system the arrangement must be such that the metal flows without turbulence and agitation caused by abrupt turns, projecting cores, or mold sections which will break up the oxide skin. Molds usually are gated at the lowest point. Short freezing or solidification range of aluminum bronze requires liberal risering and use of chills in areas hard to feed.

Relating Chill and Hardness

In our foundry operations we have used chill tests for some time as an aid in coupola control. The test pieces have been cast in an oil sand core against a machine cast iron plate, much as in the book, *The Cupola and Its Operation*. Recently it has been suggested that there should be a relationship between chill tests and Brinell hardness number, which we check frequently along with our chemistry. Undoubtedly there is such a relationship, but we question its accuracy. Can you suggest references on this subject for us to study and evaluate?

As you indicate, there is a relationship between chilling tendency and Brinell hardness, but that is by inference rather than concrete data since a brief search of the literature does not provide any specific information. Perhaps this point is expressed best in an excerpt from "Chill Tests and the Metallurgy of Gray Iron" by D. E. Krause in *Transactions*, American Foundrymen's Society, 1951, which states as follows:

"Since a fair relation exists between chilling tendency and carbon equivalent provided melting and ladle practice are fairly uniform, and since there is a fairly good relation between carbon equivalent and tensile strength, it has been found that there is a relation between tensile strength and chilling tendency. A similar relation has been found between Brinell hardness of gray iron and depth of chill. In some cases the relations are very good while in others the relation is quite broad."

It seems to us that since you are running both chill tests and Brinell hardness readings, it should not be a difficult matter to examine the data obtained and determine what relationship exists between them.

Has Trouble in Finishing

In our foundry we use yellow brass containing 67 per cent Cu, 1.0 per cent Sn, 2.0 to 3.5 per cent Pb, 0.30 per cent Ni, 0.20 per cent Fe, remainder Zn to which we add a small amount of Al, to make small ornamental castings. From time to time we have complaints from the tumbling department that the castings will not respond, become hard and brittle, and show no improvement in finish.

Your failure to obtain a satisfactory finish on the brass castings may be due to metal composition or to the tumbling operation. Since aluminum as well as tin and iron tend to harden yellow brass, it may be that those elements are higher than you suspect in those castings which give trouble. The only way to find out would be through analyses of satisfactory and unsatisfactory castings.

The difficulty also may arise in the relationship of load, abrasive material, speed of rotation, etc. in the tumbling operation. Indications are that the cleaning action depends on the sliding of pieces on each other and on the abrasive material, not on pressure. Hence, the fastest work is accomplished when the barrel is half full. Cleaning action cannot be accomplished on all surfaces of the pieces by sliding action alone, and various materials such as balls, stars and other metallic shapes, sand, rock chips, abrasive shapes, etc., are added. Usually the heavier the pieces, the higher the ratio. Size of the abrasive also has a bearing, and in general the larger and heavier the material, the greater the action on corners and exposed surfaces, but the poorer the action on protected surfaces and recesses and the poorer the finish.

Speed of the barrel should be such that the load is carried up about three-fourths the inside diameter and then falls back or over on itself according to one expert. Another mentions a speed from 5 to 35 rpm for a 30-in. diam barrel, or 40 to 275 sfpm.

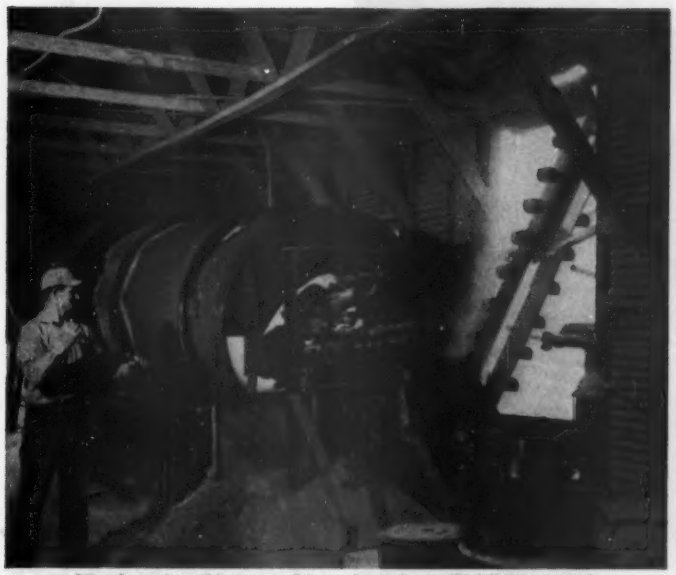
Life Expectancy Too Short

In our steel foundry in Europe, we produce austenitic steel castings and have a problem in that the final samples from the furnace always show a higher carbon than those of castings from the same melt. We generally use an electrical measuring device at the furnace, but we have tried pouring larger specimens and analyzing them, and they check the instrument. An example is a final furnace test carbon of 1.2 per cent while the casting or sprue around 2 in. thick shows 1.15 per cent C. Some of our customers are not satisfied with the casting life and claim that they are too soft. We have checked the quenching operations, and the structures are fully austenitic.

Before discussing possible cause of the difference in carbon content, we would like to point out that the excessive wear you indicate is not due to that difference. Wear resistance quality of austenitic manganese steel is engendered only when work hardening by peening or impact is involved, such as digging in rock or other hard materials. If used in soft materials such as sand or clay, it may wear faster than normalized steel with 250 Brinell hardness. If that is the case, we suggest you supply a quenched, low alloy steel which is hardened to 400 to 450 Brinell.

It appears that your question on carbon refers to the limit of accuracy in commercial determinations, and that can be established only by careful, painstaking work on a number of "standard" samples by different analysts. If you are sure that the difference is not due to analytical errors, then the variation is due to decarburization resulting from exposure of the molten metal to the atmosphere during pouring and to mold gases as the cavity is being filled. In low carbon steels a decrease of 0.01 per cent carbon can be expected between furnace and castings. With the higher carbon content in your manganese steel, the decrease might be expected to be about what you indicate.

HOT MATERIALS ELEVATOR BELT



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J. C. and J. W. Barry watch the hot silica being funneled into loader equipped with "U.S." loader belt.

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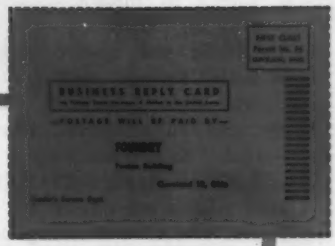


What's New in Equipment and Supplies

HEAT-RESISTANT CLOTHING

Line of asbestos safety clothing is said to shed molten metal at 3000° F without deterioration or loss of resiliency. Called Thermogarb, garments of this fabric will

reflect approximately 50 per cent of radiant heat and are light weight. The line includes coats, leggings, cape sleeves, coveralls, sleevelets, spats, pants, chaps, and aprons, all in white or yellow.—**American Optical Co.**, Southbridge, Mass.

For More Details Circle No. 451—Page 45

SHELL SAND ADDITIVE

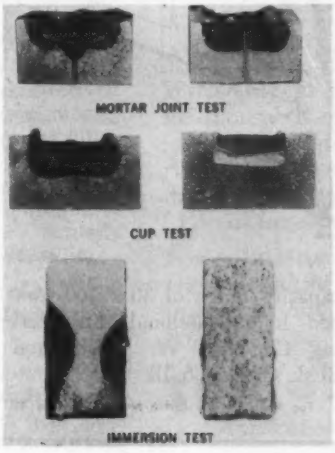
Chemical additive, Nuodex Sand-Plus, is used in cold coating of sands where the resin and a suitable solvent are mixed with the sand along with a curing agent. Material is added to the resin sand mix and the solvent is evaporated, leaving behind a dry coated sand mixture. When Nuodex Sand-Plus is used with the original mix, the resin is said to coat the sand more uniformly, giving increased tensile strength to the shell core or mold. Also, it is claimed that blocking of the coated sand in storage is reduced and removal of patterns from the sand is facilitated.—**Nuodex Products Co.**, P. O. 242, Elizabeth, N. J.

For More Details Circle No. 452—Page 45

REFRACTORY MATERIAL

Alumina in stabilized crystalline form is the main constituent of a refractory material developed for use in melting aluminum. In brick form it is known as Coral, and the joint material is called Coralbond. The material features resistance to corrosion and impact during furnace charging. Also, it is said to avoid contamination so that rigid alloy specifications can be met.

The illustration shows three comparison tests between conventional refractories on the left and company's material on the right. These

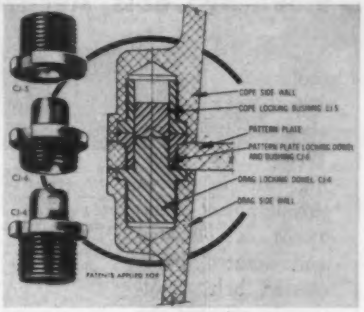


tests show the new material's resistance to penetration.—**Harbison-Walker Refractories Co.**, 307 Fifth Ave., Pittsburgh 22, Pa.

For More Details Circle No. 453—Page 45

PATTERN PLATE DOWELS

Dowel and bushing assemblies, eight to the average flask, lock flask walls to pattern plate to prevent flask deformation under heavy squeeze pressure. When the pattern plate is removed, cope and drag walls lock together so that they open as a unit when corners are popped open—eliminating strain on



flask pins and bushings. Assemblies can be used with 3/8, 7/16, and 1/2-in. pattern matchplates. Two sizes are made for flasks with 1 to 1¼-in. flanges, and 1½ to 2-in. flanges. —**Hines Flask Co.**, 3431 W. 140th St., Cleveland 11, Ohio.

For More Details Circle No. 454—Page 45

CUTOFF WHEELS

Cutoff wheels are designed for safe, economical operation in all types of high-speed production cutting. Complete line includes resinoid, resin-rubber, and rubber, reinforced and nonreinforced straight

cutoff wheels in thicknesses from 1/32 to ¼ in. Wheels are of aluminum oxide and silicon carbide abrasives in various combinations and grain sizes. Resinoid, resin-rubber, and all reinforced wheels are available in diameters up to 20 in., and rubber wheels up to 26 in.

Cutoff wheels are offered for all makes and models of machines and both wet and dry cutting operations. — **Simonds - Worden - White Co.**, 1101 Negley Place, Dayton 7, Ohio.

For More Details Circle No. 455—Page 45

SELF-CURING SAND BINDER

Resin-type sand binder called Kold-Kure requires no baking to make cores or molds for iron or steel castings. The only additives mixed with the sand are the activator and the binder. Although the binder allows sand to flow freely into the mold, hand ramming is required to produce good core details and sharp edges. Uniform strength and easy shakeout are claimed.

Three types of Kold-Kote washes also have been introduced. Type S has a silica flour refractory base,

Type Z a zircon flour refractory base, and Type G a graphite refractory base. The 400-cu-ft steel slag ladle shown here weighs 40,000 lb and has 2½-in. sections. It was produced with the new binder.— **G. E. Smith Inc.**, 246 Washington Rd., Pittsburgh 16, Pa.

For More Details Circle No. 456—Page 45

EPOXY RESINS

Company has introduced a complete line of formulated epoxy resins. Foundcast 101 for making molds and patterns has good machinability and easy foundry mold release and draw. Sandbind 201 for making molds for casting epoxy duplicates has greater durability than plaster, holds corners sharply for retention of detail, and requires no wet mixing. Layup 501 for making molds and patterns with fiberglass layups penetrates the glass completely, has a high rate of application, will not allow the glass layers to delaminate over time, and has a hard surface finish. All these materials are said to hold close dimensional stability.

Facecoat 301 for use with epoxy molds and patterns has a high surface smoothness and hardness for easy draw and good release.—**Allaco Products**, 238 Main St., Cambridge 42, Mass.

For More Details Circle No. 457—Page 45

TWIN ELECTRODE TORCH

Model B-3 twin electrode torch is designed for use with any ac welding machine. Two cored carbon

electrodes produce an electric arc for heating, soldering, brazing, and welding. — **Arcair Co.**, P. O. Box 431, Lancaster, Ohio.

For More Details Circle No. 458—Page 45

BANDSAW BLADE

Bandsaw blade is claimed to have hard teeth, tough body, and uniform full-blade flexibility for high-speed cutoff work on ferrous metals. It is said to provide up to 300 per cent longer life. The blade comes welded to length in all standard widths, thicknesses, and tooth spacings.—**Heller Tool Co.**, Newcomerstown, Ohio.

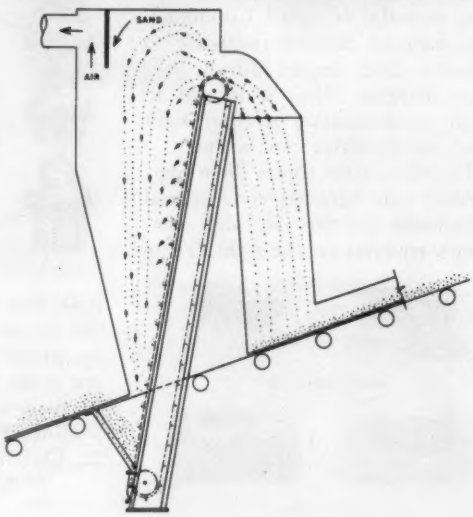
For More Details Circle No. 459—Page 45

INDUCTION MOTORS

Motor overload protection is available on Tri-Clad '55 three-phase induction motors up to 125 hp, frame sizes 254 to 445U, in any insulation class or enclosure. Protection is provided by two or more miniature heat-sensing switches buried in the stator windings. The switches, connected in series with conventional motor control, shut off the motor whenever internal winding temperature exceeds a predeter-

Elevator Cools, Aerates Sand in Minimum Time

Coolevayor sand cooler is charged directly from a shakeout belt. Within the housing, air is passed through hot sand as it is elevated and aerated by a cleated belt. Cooling is effected by evaporation of moisture. Intensity of cooling is controlled by varying the length of time sand is retained within the housing and the volume of air exhausted.



Unit occupies less than 40 sq ft of floor space and requires a minimum of equipment revision for incorporation into the system. Three basic models are offered in a capacity range of 30 to 60 tons per hour.—**National Engineering Co.**, 549 W. Washington Blvd., Chicago 6, Ill.

For More Details Circle No. 487—Page 45

Circle 590 on Page 45→

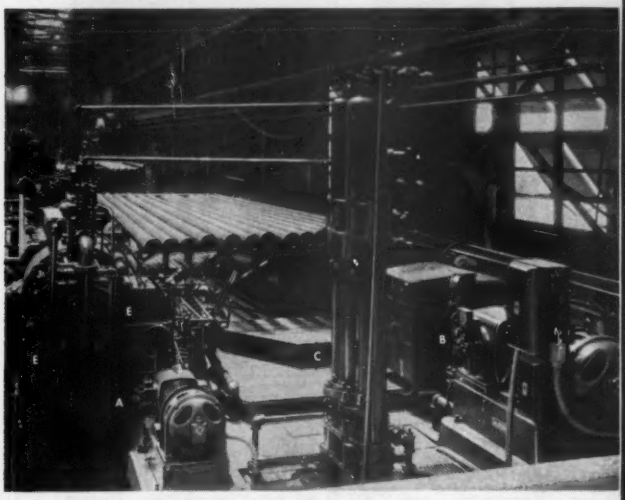
Fluid Power news

REPORT NO. 11,803 TEST MORE PIPE—LONGER WITH OILGEAR

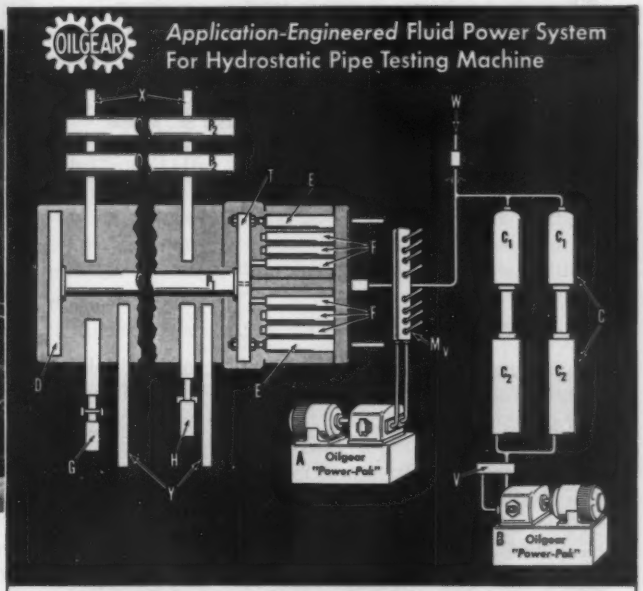
From Oilgear *Application-Engineering* Files

HOW OILGEAR SYSTEM POWERS PIPE TESTER EFFICIENTLY AFTER 23 TROUBLE-FREE YEARS

DATA: To supply power and control system for five functions of a hydrostatic pipe testing machine designed for a wide variety of pipe sizes and testing pressures ranging up to 6000 psi. Linear drives and controls were needed to: *1.* Actuate jaw-type clamps to hold and prevent pipe from buckling. *2.* Traverse testing head rapidly to and from testing position. *3.* Hold testing head against pipe under testing pressures. *4.* Actuate "knockout" arms to eject tested pipe from machine. *5.* Actuate an intensifier to boost water used for testing from city pressure to any selected testing pressure up to 6000 psi. *Specific Operating Requirements:* Simple, safe, dependable; capable of continuous, 'round-the-clock operation, 6 days per week in highly humid atmosphere; cycle rapidly for economical production; require a minimum of maintenance to prevent costly, line-stopping downtime; must be compact to conserve valuable floor space, economical in the use of electrical power.



Hydrostatic Pipe Tester with Oilgear *Application-Engineered Fluid Power System* as installed in 1937, and operating continuously since that time. Oilgear "Power-Paks" (A,B), Intensifier (C), Rapid Traverse Testing Head Cylinders (E) are indicated by arrows. Manifold and Control Valves at operator's station (M_V in drawing) are clearly visible, as are the direct-reading, operating pressure gages on the "Power-Paks." Testing pressures are quickly preset with a small handwheel on "Power-Pak" (B)—not visible. Pipe to be tested rolls directly from pre-testing storage racks, at right, directly into the machine.



HOW IT WORKS: Pipe to be tested (P_2) rolls from storage rack (X) into cradle of machine between Testing Head (T) and Tail Carriage (D). Testing Head (T) is moved forward quickly by Double-Acting Cylinders (E). Clamping Jaws actuated by Cylinder (G) grip the pipe along its length to prevent buckling. Pipe (P_1) is pre-filled with water at city pressure (W). Single-Acting Test Head Holding Cylinders (F) move up in matching pairs—2, 4, 6, 8, 10, or all 12 can be selected—depending on pipe size and testing pressure to hold Testing Head (T) against Pipe (P_1) and Tail Carriage (D). Movement of cylinders (E, F, G, H) are all controlled by valves mounted on Manifold (M_V) which direct fluid flow from Oilgear "Power-Pak" (A). Water at preselected test pressure from Intensifier (C) then exerts pressure on Pipe (P_1). Oilgear "Power-Pak" (B) supplies *Fluid Power* through Valve (V) to actuate Hydraulic Intensifier Cylinders (C_2) increasing pressure in Water Cylinders (C_1) to any desired pressure up to 6000 psi. After pipe is inspected, intensifier pressure is released, Testing Head (T) is rapidly retracted, and Knockout Cylinder (H) actuates mechanism to eject tested pipe onto rack (Y). Machine is then ready to start a new test cycle.

SOLUTION: An *Oilgear Application-Engineered System* consisting of two Oilgear Heavy-Duty "*Power-Paks*," Directional Control Valves, and "Custom-Quality" Cylinders. Each "*Power-Pak*" uses an Oilgear Heavy-Duty One-Way Variable Displacement Radial Rolling Piston Pump with automatic pressure unloading control to reduce pump stroke when holding a preset pressure indefinitely; eliminate excessive heating and power loss; reduce electrical power input requirements. Oilgear Pumps contain integral auxiliary systems for pilot, supercharge, cooling and filtering . . . with constant pressure and flood self-lubrication, conservatively loaded anti-friction bearings, and large internal passages—mechanical and hydraulic friction is reduced to a minimum for high efficiency . . . virtually guaranteeing a long, trouble-free, maintenance-free life.

USER REPORTED IN 1938—"*. . . after one year of operation we have nothing but the highest praise for the Oilgear Equipment on this pipe tester.*"

USER REPORTS IN 1960—"*This machine has given us years of trouble-free service, operating around the clock six days a week . . . maintenance has been at a minimum, with occasional changes in intensifier packings, as would be expected in normal operation . . . performance has been completely satisfactory.*"

With Oilgear Heavy-Duty System Components designed for thousands of hours of continuous service at full rated load, savings are compounded with every hour of uninterrupted performance. That's why machinery and equipment manufacturers and *their* customers say . . .
"*For the lowest cost per year . . . it's Oilgear!*"

For solutions *to YOUR linear or rotary Controlled Motion problems, call the factory-trained Oilgear Application-Engineer in your vicinity. Or write, stating your specific requirements, directly to . . .*

THE OILGEAR COMPANY

Application-Engineered Controlled Motion Systems

1573 WEST PIERCE STREET • MILWAUKEE 4, WISCONSIN

Phone: Mitchell 5-6715 . . . Direct Distance Dialing Code 414

EXECUTIVE REPORT #21

THEY SAID "IT COULDN'T BE DONE"

but Wheelabrator® cleaned this 100-ton casting in 20 minutes

The enormity of a casting like this would have made it one of those "impossible" cleaning jobs by manual airblasting. But a Wheelabrator Car-Type Room equipped with 8 blasting wheels takes it in stride at Canadian Steel Foundries, Ltd. Here, castings measuring 20 ft. in diameter and over 12 ft. in height are cleaned thoroughly in blast cycles of only 15 to 20 minutes in the automated Wheelabrator room.

Wheelabrator engineers, leading in experience in designing machines for special applications, have developed a line of blast rooms employing unique work-handling methods suited to varied requirements. For illustrated examples, ask for Catalog 142-D. Wheelabrator Corp, 505 S. Byrkit St., Mishawaka, Ind. In Canada, P. O. Box 490, Scarborough, Ont.

WHEELABRATOR
AIRLESS BLAST EQUIPMENT

Circle 591 on Page 45

mined amount regardless of rate of temperature rise.

System provides many advantages: Reduces burnouts from overload; enables the drive motor to be matched closely to the load by manufacturers of driven equipment; eliminates expensive control devices, relays, or amplifying circuits; speed protects the motor against sudden overloads due to single-phasing or stalling and from sudden overheating due to accidental loss of ventilation; and any break in wires, switches, or connections acts to stop the motor.—**General Electric Co.**, 1 River Rd., Schenectady 5, N. Y.

For More Details Circle No. 460—Page 45

HARDNESS TESTER

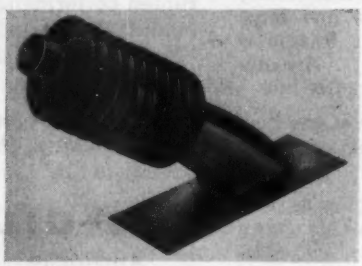
Metal hardness testing machine incorporates a direct reading Brinell hardness gage. By combining accurate load application with simultaneous readout of Brinell hardness level, Air-O-Brinell machine provides speed and accuracy for production line testing.

Operator adjusts the air pressure regulator valve until desired Brinell load is indicated on the gage. Once the load is set, any number of hardness tests can be made in rapid sequence. Large gage mounted in the head of the unit is calibrated for standard Brinell loads of 500, 1000, 1500, 2000, and 3000 kg. Range of the gage is determined by customer requirements. Unit is available in two standard models with vertical clearance from the anvil to the ball of 9 or 16 in.—**Tinius Olsen Testing Machine Co.**, 938 Easton Rd., Willow Grove, Pa.

For More Details Circle No. 461—Page 45

SLEEVES AND BOOTS

Various combinations of accordion sleeves, boots, covers, and curtains are available to fabricate protection for a wide range of mechanical, hydraulic, and pneumatic uses. Chloroprene coated nylon materials meet government specification MIL-C-20696. Material is said to withstand temperature range of −80° to 220° F without cracking. Piston rods, rams, jacks, and entire drives are protected while moving horizontally, vertically, back, forward, and at any required angles. Assortment of contours and shapes is available.—**A & A Mfg. Co.**, 712 S. 12th St., Milwaukee 4, Wis.



For More Details Circle No. 462—Page 45

PROPELLER-TYPE FANS

Low-speed, high-volume, propeller-type fans are for use where a single fan must be used in place of several smaller units. Series includes sizes from 65 to 94 in. in belt-drive, direct-drive, or pulley-drive construction. The 94-in., 25-hp models move 174,000 cfm at free air or 157,000 cfm against ¼-in. static pressure.

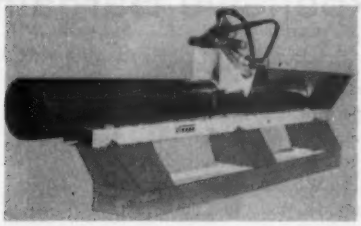
Hubs and blades are aluminum alloy castings. Blade housings cast into the hub hold threaded blades

which are locked into the position at the desired angle setting by tension bolts. All hubs are statically balanced, and all blades are balanced against a master blade and are interchangeable.—**Hartzell Propeller Fan Co.**, Piqua, Ohio.

For More Details Circle No. 463—Page 45

VIBRATORY FEEDER

Vibron variable frequency high compression drive and spring system make unit useful in conveying bulk materials such as ground silica flour, bentonite, carbon black, fly ash, and all types of powdery



flours. Balanced construction facilitates installation by suspension, resting on supports, or even mounting on wheels. Control of both frequency and power provides efficient and accurate feed rates completely independent of plant power fluctuations. The air required to convey 25 tons per hr of dry molding sand is said to be less than that required to operate a ¼ in. pneumatic hand drill at 50 psi pressure. The feeders are available in all sizes and materials.—**Burgess & Associates Inc.**, 3790 W. 150 St., Cleveland 11, Ohio.

For More Details Circle No. 464—Page 45

PORTABLE WELDER

Portable direct current welding machine can be used as an alternating current power source with 3500 watts of 60-cycle, single-phase, alternating current power output. The direct current welding output is controlled with ten main tap settings ranging between 45 and 200 amp with a fine control for intermediate settings. Unit is said to handle all types of alternating current and direct electrodes from 1/16 to 5/32-in. diam and most 3/16-in. diam electrodes up to the capacity of the unit. Two or more welders can be connected in parallel for heavy welding jobs. The engine-driven welder is mounted on a two-wheel dolly and comes

complete with a welding kit containing two 20-ft No. 2AWG conductor cables with electrode holder and ground clamp and a helmet with a No. 10 lens.—**A. O. Smith Corp., Welding Products Div.**, Milwaukee, Wis.

For More Details Circle No. 465—Page 45

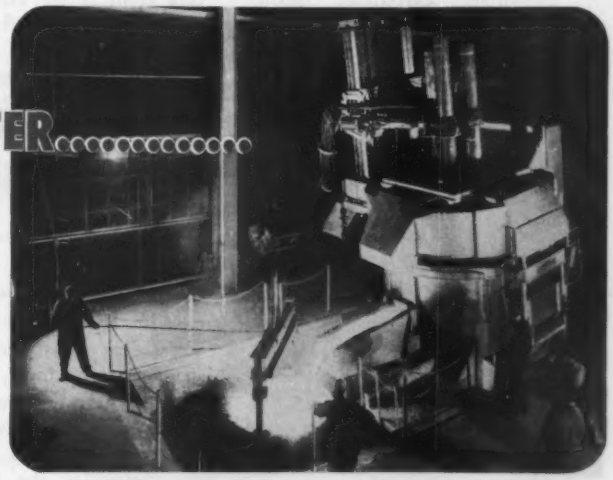
HEAT RESISTANT GLOVE

Glove has leather palm and aluminized asbestos back and thumb, making it suitable for work in extreme radiant heat. The material on the back of the glove is a combination of asbestos and a heat resistant fabric which is said to be flexible, light, and fully insulating.

EXECUTIVE REPORT #23

THE FOUNDRYMAN'S FILTER

Wheelabrator® Dustube® Collectors trap electric furnace dust and fume



Foundrymen who are concerned with costs rely on Wheelabrator Dustube Collectors to meet their local air pollution codes, and provide clean, dust-free air in the foundry, at the most favorable balance of cost to collection efficiency.

With a Wheelabrator electric furnace ventilation system, a discharge free of visible solids is insured. This hood and exhaust system will not restrict furnace operation and maintenance, nor affect metallurgy. Easy furnace roof replacement, maximum furnace roof life, minimum hood maintenance are assured.

Wheelabrator Dustube Collectors are in use today in 44 foundries, on some 64 electric furnaces . . . your assurance of complete furnace fume control.

WHEELABRATOR EXPERIENCE IS AT YOUR SERVICE

This knowledge of electric furnace fume control is at your disposal. Call your local Wheelabrator Dust and Fume Engineer. Or, write to WHEELABRATOR CORP., 505 S. Byrkit St., Mishawaka, Ind. In Canada, P. O. Box 490, Scarborough, Ont.

WHEELABRATOR
DUST AND FUME CONTROL

EXECUTIVE REPORT #24

APPEARANCES CAN BE DECEIVING

"Low-Price" Abrasives Can Be An Expensive Bargain

Measure the bars. The top one appears smaller, but it's not. Measure your present abrasive cost, and compare it with the proven low cost of Wheelabrator Steel Shot.

Don't be deceived by a low initial price. It's abrasive performance that gives true blasting economy . . . the lower abrasive consumption, faster cleaning, and lower maintenance enjoyed by users of Wheelabrator Steel Shot. Try it, and take a true measure of blast cleaning economy.

SEE THE PROOF IN YOUR OWN PLANT

Your Wheelabrator abrasive engineer will demonstrate the superior performance of Wheelabrator Steel Shot in your own plant. For data to help you control all your blast cleaning costs, write for Bulletin 905-D. Wheelabrator Corp., 505 S. Byrkit St., Mishawaka, Ind. In Canada, P.O. Box 490, Scarborough, Ont.

WHEELABRATOR
STEEL ABRASIVES

Circle 593 on Page 45

A five-finger carpincho leather glove, a one-finger mitten of green heat-resistant leather, and a five-finger glove of green heat-resistant

leather are available. All models are either lined or unlined.—**Air Reduction Sales Co.**, a division of Air Reduction Co., 150 E. 42nd St., New York 17, N. Y.

For More Details Circle No. 466—Page 43

STAINLESS STEEL BILLETS

Stainless steel and alloy melting Bill-Ettes are for investment casting. Use of the material eliminates cutting from larger units. Billets are available in 30 different alloys in exact specifications.

Small sizes are packed in 100-lb kegs, and larger units are packed on skids. Various sizes are manufactured, to meet any requirement.—**Dreifus Steel Corp.**, 8 Cynwyd Rd., Bala Cynwyd, Pa.

For More Details Circle No. 467—Page 45

CHAIN HOIST

Reading Hoist features a special load brake which eliminates the danger caused by wornout ratchet wheels or lock pawls. Use of shock-resistant aluminum alloy has kept the weight of the ½-ton capacity hoist to 26½ pounds, and the 3-ton model weighs only 70½ lb. Other features include low headroom design, heat treated alloy steel for gears, shafts, and load chain, galvanized hand chain, and roller main bearings. Hoists are available in seven sizes ranging from ½ to 10-ton capacities. — **Reading Crane & Hoist Corp.**, 2100 Adams St., Reading, Pa.

For More Details Circle No. 468—Page 45

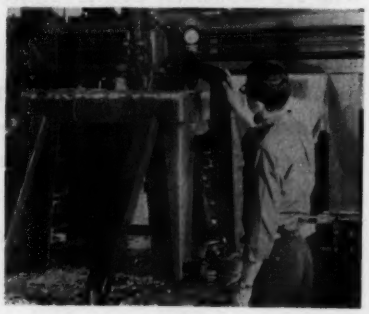
PNEUMATIC LUBRICATOR

Injecto-O-Mist pneumatic lubricator is designed for use with intermittently operated air cylinders, motors, and hand tools. Aluminum end bells overlap a short oil sight glass, providing maximum strength and wear protection to this part. Unit is available in horizontal, up, or down air discharge in ⅛, ¼, or ⅜-in. sizes.—**Carlson Products, Inc.**, 5309 North 24th St., Omaha 10, Nebr.

For More Details Circle No. 469—Page 45

MOBILE HARDNESS TESTER

Mobile hardness tester uses lightweight, cast aluminum C-clamps to



hold the unit on the workpiece. Preloaded springs contained in individual spring sleeves produce the test loads, which can be varied by changing spring units. Model M-I has a test thickness of 6.3 in. with throat depth of 3.3 in. and weighs 17 lb. Model M-II tests thicknesses up to 9.8 with a throat depth of 5.1 in. and weighs 18 lb.

Both models read in Rockwell C values, but optional equipment permits testing on Rockwell A and B scales. Accessories include C "Brale" diamond penetrators, 1/16 in. ball chuck penetrators, test blocks, and calibrated kilogram weights.—**Wilson Mechanical Instrument Div., American Chain & Cable Co.**, Bridgeport 2, Conn.

For More Details Circle No. 470—Page 45

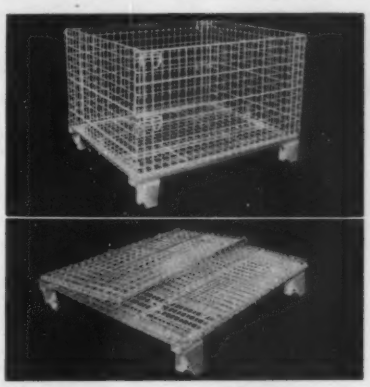
MOLD COATING

"dag" 206 is a concentrated stable dispersion of colloidal molybdenum disulfide in water. Besides providing long shelf life, it will not become acidic. After dilution in water, the dispersion can be applied by spray, brush, or swab on preheated metal surfaces to provide a film with high-pressure, high-temperature lubricating properties.—**Acheson Colloids Co.**, Port Huron, Mich.

For More Details Circle No. 471—Page 45

WIRE BOXES

Collapsible wire mesh boxes known as Loadtainers are available for use on production lines, for shipping, or for warehouse storage. The box is fabricated from 2-gage, 70,-



000 psi minimum ten str wire welded into 2 x 2-in. spacing with a deck made from ⅞ by 1½-in. hot rolled steel for the end channels and ¼ by 1½-in. bar stock spaced across the bottom for more support.

Available with capacities of either 2000 or 4000 lb, the box folds to pallet height for easy storage. Two models are provided, differing in leg design. The Atlas has steel legs and the Titan has skids. — **Republic Steel Corp., Berger Div.**, 1038 Belden Ave. N.E., Canton 5, Ohio.

For More Details Circle No. 472—Page 45

NYLON AIR HOSE

Synflex self-storing air hose is impervious to oils, resists kinking, and handles pressures up to 200 psi. Made of nylon, Model S12 has an inner diameter of ⅜ in. and can store a working length of 20 ft in a 5-in. diam coil that is 9 in. long. —**Synflex Products Div., Samuel Moore & Co.**, Mantua, Ohio.

For More Details Circle No. 473—Page 45

FRONT-END LOADER

TL-12 front-end wheel loader with fourwheel drive has a carrying capacity of 4000 lb and static

EXECUTIVE REPORT '28

RING PLANT WRINGS OUT MORE PRODUCTION

with Super Tumblast®

With a 14 cu. ft. Wheelabrator® Super Tumblast, Muskegon Piston Ring Co. of Sparta, Michigan, has increased cleaning room output to meet increased production.

The Super Tumblast, installed late in 1959, has averaged 150 tons of production per week, cleaning a wide variety of gray iron castings. Throwing 100% more abrasive per minute than the blast equipment previously used, the Super Tumblast cleans 800-lb. mixed loads, producing superior finishes in blast cycles of only 5½ minutes.

Maintenance through months of continuous service has been negligible. Only routine lubrication, inspection and adjustments have been required. Blade life of over 400 wheel-hours per set is a result of the high efficiency of the new CFS Separator.

IT PAYS TO REPLACE INADEQUATE EQUIPMENT

Your Wheelabrator engineer will help you analyze impartially the economics of replacing obsolete blast equipment with the unsurpassed production power of a Super Tumblast. Without obligation, write to Wheelabrator Corp., 505 S. Byrkit Street, Mishawaka, Indiana. In Canada, P. O. Box 490, Scarborough, Ontario.

WHEELABRATOR
AIRLESS BLAST EQUIPMENT

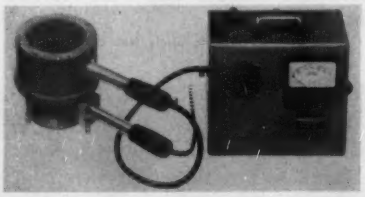
lifting capacity of 9500 lb. Two multiple disc, dry-type clutches with hydraulic engagement permit control of both forward and reverse movement without stopping the machine to clutch and shift gears. The transmission also has an automatic clutch cutoff which disengages the clutch when the brakes are applied.

Four buckets are available for the unit, ranging from 1 to 2-cu-yd capacities mounted for a maximum dumping clearance under the cutting edge of 8 ft 4 in. Power steering is standard and the turning radius is 19 ft 5 in. Foam rubber seat and power boosted brakes also are standard equipment. — **Allis-Chalmers Mfg. Co.**, Milwaukee 1, Wis.

For More Details Circle No. 474—Page 45

HYDROGEN TESTER

Hydrogen content in molten aluminum is determined precisely by the Hycon tester. Testing is performed by ladling a small quantity of molten aluminum into unit's electric vacuum furnace. The furnace is evacuated at a predetermined rate while measurements are made of vacuum and temperature. In one minute, these data indicate the gas content to ±0.5 ml of H per 100g.—**Meltronics Inc.**, 1010 N. Main St., Elkhart, Ind.



For More Details Circle No. 475—Page 45

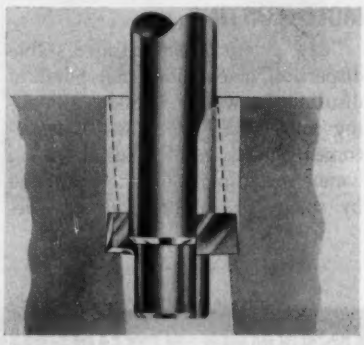
RADIATION PYROMETER

West-Land radiation pyrometer provides continuous temperature control with convenience and reliability. Applications include furnaces and kilns with temperatures of 1400° F-6000° F. No recalibration is necessary while the target area exceeds minimal standards. The pyrometer is said to be calibrated to match the precision of the best base-metal thermocouples and includes temperature compensation and emissivity adjustment. It is available in a wide selection of temperature ranges, scaled in Fahrenheit or Centigrade.—**West Instrument Corp.**, 4363 W. Montrose Ave., Chicago 41, Ill.

For More Details Circle No. 476—Page 45

CORE HOLE BORER

Adjustable Core-Rector cutters are designed to eliminate core drift while boring cored holes. Unit is said to provide a true hole even though the cored hole deviates from centerline in the workpiece. Cutters



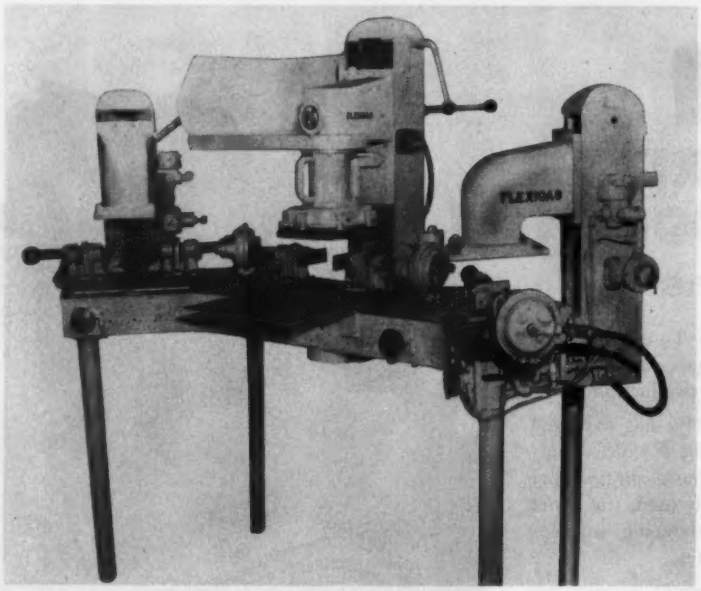
can be used on turret lathes, bar automatics, chucking machines, boring mills, vertical turret lathes, or radial drills. A full range of sizes for high-speed, accurate boring of virtually any cored hole is available.—**Muskegon Tool Industries Inc.**, 11th & Western, Muskegon, Mich.

For More Details Circle No. 477—Page 45

MATERIALS TESTER

Materials testing system is capable of simultaneously programming and applying rapid variations of temperature and load or strain while separately recording temperature, load, and strain with respect to time, as well as load vs. strain directly. The loading frame has a motorized crosshead, a hydraulic loading ram, and a precision load measuring cell. Applied force is variable from 10,000 lb tension to 10,000 lb compression. Pencil-drawn program charts are translated into operating control signals by two synchronized Data-Trak func-

Coreblower Includes Two CO_2 Gassing Units



Unit for blowing and gassing of CO_2 process cores is said to produce cores at a speed comparable to that of oil-sand core production. Made up of one CB5 Flexiblo coreblower and two FG5-10 Flexigas gassing units, the machine uses a semicircular table to minimize operator movement. Two gassing units are provided because gassing time per core is longer than blowing time. —**Beardsley & Piper Div., Pettibone Mulliken Corp.**, 2424 N. Cicero Ave., Chicago 39, Ill.

For More Details Circle No. 488—Page 45

Cores bake fast... really hold together with

PENOLYN 178 CORE OIL

Each of the automobile differential carrier cores shown above weighs about 40 pounds. And each core was baked in a vertical conveyor oven at 480°F with a *1-hour cycle*, load to unload. To obtain this fast baking time, the foundrymen used PENOLYN 178. In addition to speed, this clean-working core oil provided them—as it will provide you—with high-baked strength, toughness, and optimum collapsibility.

As a leading producer and nation-wide marketer of core oils for 30 years, Penola is quite proud of its position as a leader in the development of new and more efficient core oils. For further information, contact your nearest Penola office or write: 15 West 51st Street, New York 19, New York.

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Circle 595 on Page 45

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If you missed seeing Royer's demonstration of Step-By-Step Mechanization of Sand Conditioning Systems at the recent show, then these pictures of our booth will give you some idea of tne *technique* of Step-By-Step Mechanization.

The realistic way to tackle sand conditioning—or any other problem—is by certain basic steps. Hence, our Step-By-Step plan lets *you* mechanize *your* foundry on a "pay-as-you-go" basis.

Get the facts—and the figures (less $ than you imagine)—write for particulars on Royer Scrap Control Units, Separators & Blenders, and other sand conditioning equipment.

New! Tells how Royer Separators & Blenders give cooler, cleaner sand. Complete specifications. Ask for Bulletin #SS-60.

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Circle 596 on Page 45

tion generators for any type of program up to 300 sec in duration. Test specimens are heated by passing current through them or by infrared radiation.—**Research Inc.**, P. O. Box 6164 Edina Station, Minneapolis 24, Minn.

For More Details Circle No. 478—Page 45

PORTABLE BALANCER

Portable balancer is designed for vibration analysis of all types of assembled machinery, including grinding wheels and cutter heads. Amplitude of vibrations of the part under test is electromagnetically converted into electrical impulses

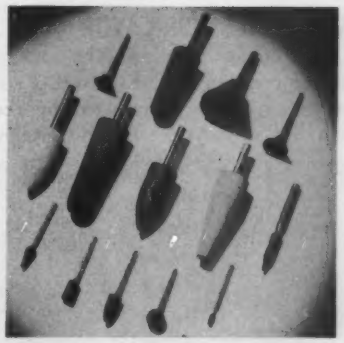
by the vibration pickup unit. These impulses are amplified in the electronic unit, which triggers a strobe light to freeze the image of the rotating part. The angle of unbalance is indicated through the stroboscope.

The stroboscopic unit and meter are mounted in the same portable head to allow reading of the meter and the strobe simultaneously from one position. It operates on 115 v, 60 cycle, single phase current.—**Stewart-Warner Corp.**, 1826 Diversey Pkwy., Chicago 14, Ill.

For More Details Circle No. 479—Page 45

GRINDING WHEEL

Grinding wheel or point is designed for most portable hand grinder applications and is available in standard A, B, and W shapes and sizes. Tool is offered in four different bonds and in a variety of grain sizes from coarse to very fine. The four bonds include Fibrasive for finish grinding of plastic molds, dies, and precision parts; rubber for die and mold polishing and for finish grinding of stainless steel welds; resinoid for snagging work on ferrous and nonferrous castings; and



vitrified for general use where open-structure, free-cutting wheels are required.—**Simonds Worden White Co.**, 1101 Negley Place, Dayton 7, Ohio.

For More Details Circle No. 480—Page 45

MAGNETIC PARTICLE TESTER

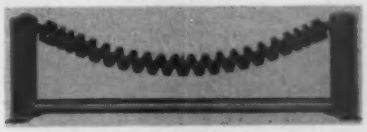
Ferroscope magnetic particle testing unit is said to detect flaws as deep as ½ in. below the surface. Two models are available, one stationary and the other mobile, for detecting inclusions, seams, weld defects, and cracks of all kinds.

The stationary model has 6000 amp dc output and the mobile unit has a 3000 amp output for both ac and half-wave dc. Other features of the mobile unit include remote control operation and demagnetization in 15 seconds. It can be used as an auxiliary to the stationary unit to provide ac output.—**Picker X-ray Corp.**, 25 South Broadway, White Plains, N. Y.

For More Details Circle No. 481—Page 45

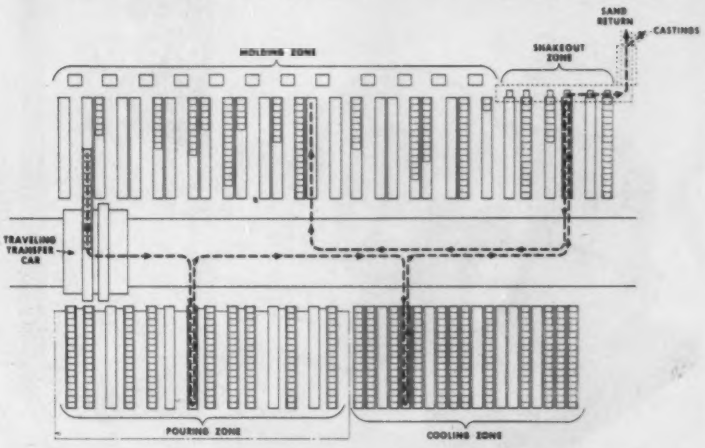
CONVEYOR IDLER

Rubber Spiral idler can be used on any belt conveyor system. A double spiral-shaped Neoprene roll



3 in. in diam is molded over a wire rope supported at its ends by high-capacity precision ball bearings.

Mold Handling System Provides Flexibility



Mold handling system is said to provide unlimited flexibility in handling, pouring, cooling, and shaking out. Each molder sets his molds on a roller top pallet with another pallet always in position to load, eliminating any delays. The entire pallet of 18 or 20 molds is loaded onto a transfer car and delivered to the pouring area.

After the molds are poured, the pallet is moved first to the cooling area and then to the shakeout zone by the transfer car. Bottom boards and flasks are returned to the molding area on the pallet.

Handling similar molds in groups permits economical handling of molds of different sizes. Slow jobs do not hold up fast ones, and minimum equipment is required because all operations are centralized.—**C. O. Bartlett & Snow Co.**, 6200 Harvard Ave., Cleveland 5, Ohio.

For More Details Circle No. 489—Page 45

Features include easy replacement of idler, smooth natural trough, corrosion resistance, and a positive cleaning action as the roll flexes. The idler is available in widths from 18 to 36 in.—**Hewitt-Robins Inc.**, Stamford, Conn.

For More Details Circle No. 482—Page 45

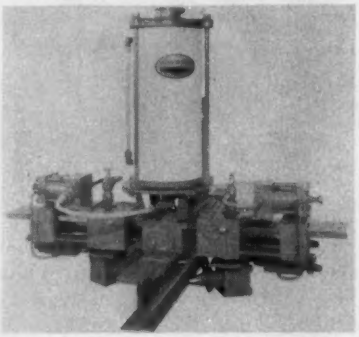
WEATHERPROOF MOTOR

Weatherproof alternating current motor is available in models producing from 1 to 125 hp. An open motor which exceeds splashproof motor specifications, unit has stator windings encapsulated in epoxy resin to resist moisture, oils, dust, chemicals, acids, and alkalies. The bearings, exposed internal metal surfaces, hardware, and mechanical parts also are protected.—**Reliance Electric & Engineering Co.**, 24701 Euclid Ave., Cleveland 17, Ohio.

For More Details Circle No. 483—Page 45

CONVEYOR LUBRICATOR

Automatic conveyor lubricator is a self-contained unit mounted on a trolley rail and actuated by the moving conveyor. As the trolley

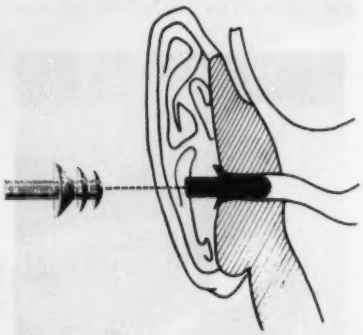


wheel approaches the lubricator, the wheel picks up the nozzle, which automatically is brought into contact with the grease fittings to discharge a measured amount of grease or oil. After discharge, the nozzle is released and returns to its initial position. A 12-lb reservoir supplies from 0 to 0.1 cu in. of lubricant to each wheel under constant pressure. Model 902 lubricates one side of the conveyor only, and Model 904 lubricates both sides.—**J. N. Fauver Co.**, 51 West Hancock, Detroit, Mich.

For More Details Circle No. 484—Page 45

EAR PLUG

Com-fit ear plug, molded of silicone rubber, is claimed to be dur-



able and pliable, nontoxic, nonallergenic, and resistant to ear wax and skin oils. The plug can be boiled and sterilized for cleanliness and interchangeability of wearers. It comes in a universal size and has a triple flange to guarantee complete sealing of the ear canal.—**Sigma Engineering Co.**, 1491 Vine St., Los Angeles 28, Calif.

For More Details Circle No. 485—Page 45

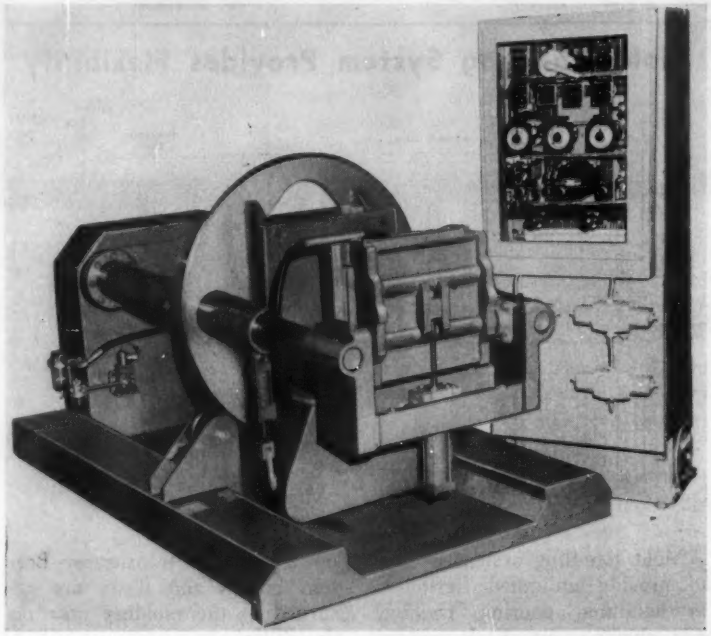
AIR LINE FILTERS

Series BE air line filters remove liquid present in compressed air. They feature a transparent bowl made of a strong plastic material. Bowl has a high safety factor and good resistance to fatigue under cycling loads. Filter is designed to be quickly and easily cleaned.

Metal bowl filters are available for applications requiring high pressures, high temperatures, and rough use. Filters with either plastic or metal bowl are for use with pipe sizes ¼, ⅜, and ½ in. Air passages through the filter are larger than the internal area of the pipe, and the area of openings through the filter element is as much as 26 times the internal area of the pipe.—**C. A. Norgren Co.**, 3400 S. Elati St., Englewood, Colo.

For More Details Circle No. 486—Page 45

Unit Ejects Shell Cores Automatically



Shell core machine features a core ejection system which eliminates any need to reach between the heater plates. Two standard-sized, interchangeable, thermostat-controlled heater plates are used for corebox sizes up to 20 x 17 x 14 in. and 20 x 25 x 14 in. Unit is fully automatic with all movements hydraulically controlled, but it can be changed quickly to single-cycle control. Over-all, blower is 80 in. long, 52 in. wide, and 50 in. high.—**F. E. North America Ltd.**, 47 Advance Rd., Toronto 18, Ont., Canada.

For More Details Circle No. 490—Page 45

Circle 597 on Page 45→

CLEAN

GLOBE SILVERY IRON is more than "surface clean"—its clean clear thru. That's because Globe is made only from virgin metal produced in a blast furnace from natural iron ores.

Using Globe assures closer chemical and physical control in the cupola and eliminates the need for highly concentrated alloy additions.

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Zurich, Switzerland, will be the scene of the 27th International Foundry Congress

International Foundry Group To Meet in Switzerland

● GENERAL THEME of the 27th International Foundry Congress will be technical advancement and improved working conditions in the foundry. The Congress will be held in Zurich, Switzerland, Sept. 19-24.

Organization of the meeting has been delegated to the Association of Swiss Iron Foundries and the Association of Swiss Metal Foundries by the International Committee of Foundry Technical Associations. All meetings and technical sessions will be held in the Congress Building, Zurich.

Three categories of papers will be presented at 24 technical sessions. These categories include new research in the foundry industry, modern processing in the foundry, and man and the foundry.

Prof. J. F. Wallace, Prof. G. W. Form, G. C. Gould, G. K. Turnbull, and H. D. Merchant, all of Case Institute of Technology, Cleveland, will present a paper on "Grain Refinement of Cast Metals." This is the official exchange paper of the American Foundrymen's Society.

Subcommittees To Meet — Meetings of the subcommittees and work-

Technical Program at Zurich Congress

Anisotropy and Mechanical Behavior of Gray Cast Iron—J. S. Abcouwer, Netherlands.

The Behavior of Hydrogen in Cast Steel—Prof. P. Bastien, France.

The Problem of the Qualification of the Gray Irons and the Role of the Secondary Structure—Dr. A. Collaud, Switzerland.

Some Results of Investigations of a Metallurgical Blast Cupola—R. Doat, H. Doutreloux, and H. DeRijcker, Belgium.

Influence of Increased Lead Content on Pressure Tightness of Leaded Red Brass 85-5-5-5—L. Ekbom, Sweden.

Some Investigations on the Properties of Molding Materials at High Temperatures—Prof. O. Hoff, F. Hauser, and Overgaard-Rasmussen, Denmark.

Experiments and Results with Light Metal Castings Poured in Aluminum Chills—K. Marechal, Hungary.

Gases in Ferroalloys—Prof. B. Marincek, Switzerland.

Graphite Formation in Cast Iron—Dr. A. G. Minkoff, Israel.

Studies in Cementite Dissociation—Prof. R. Mitsche, Austria.

Influence of Super Cooling on Fluidity of Molten Metals—Prof. Dr. S. Morita, Japan.

Starting Time of Cooling, Solidification, and Transformation in Castings—Prof. W. Patterson and W. Koppe, Germany.

Determination of Linear Combustion Rate in the Melting Zone of the Cupola—C. Podrzucki, Poland.

Aluminum Castings for Anodic Oxidation—Dr. A. Bloch, Switzerland.

Modeling of Metal Flow for the Solution of Gating Technique—M. Bednarik, Czechoslovakia.

Manufacture of Pearlitic Gray Iron in the Electric Furnace—N. G. Chakrabarti, U. K. Bhattacharya, B. K. Gupta, and N. R. Mitra, India.

Further Development of the Buehrer Molding and Pouring Equipment—W. Goetz, Switzerland.

New Research Method for the Quality Control of Cast Iron by Means of Ultrasonics—A. Lehtinen, Finland.

Determining Foundry Costs—E. Lotti, Italy.

Mold Paints and Washes for Use in the Steel Foundry—J. M. Middleton and P. G. McIlroy, United Kingdom.

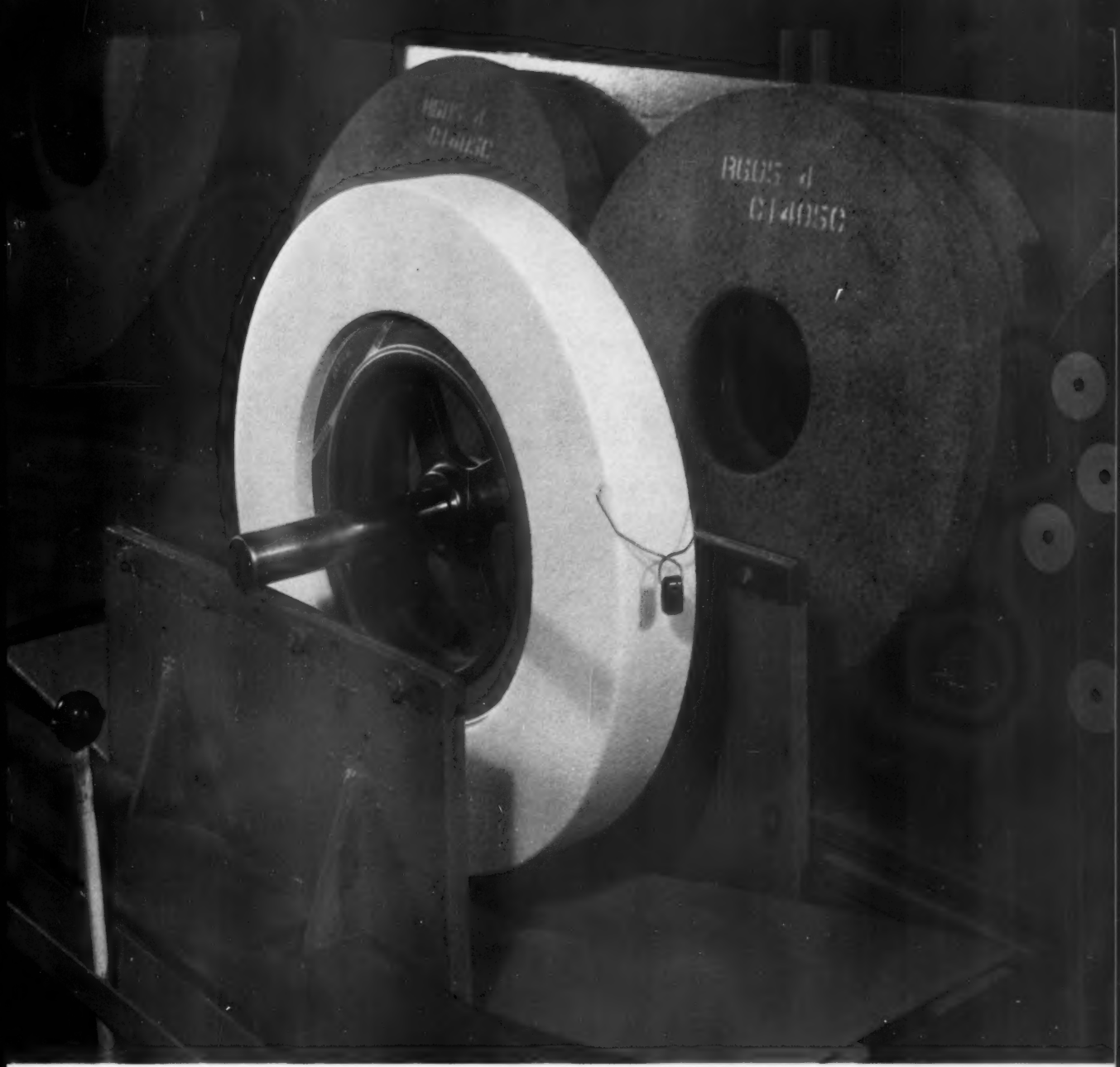
Application of Sodium Silicate-Bentonite-Sand Mixtures Without Gassing With CO_2—Prof. M. B. Pajevic and J. Kruspel, Yugoslavia.

Grain Refinement of Cast Metals—Prof. J. F. Wallace, Prof. G. W. Form, G. C. Gould, G. K. Turnbull, and H. D. Merchant, United States.

Electric Melting in the Foundry—Dr. E. Zingg, Switzerland.

Labor Harmony in the Swiss Machine and Metal Industries—Dr. H. Schindler, Switzerland.

Circle 598 on Page 45→



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"WERSMITH" fast-baking core oils are stronger-binding than most conventional core oils and, therefore, can be used in leaner ratios, for lower costs. They produce stronger cores, with fewer cracks, less breakage in handling — which means minimum loss from core defects.

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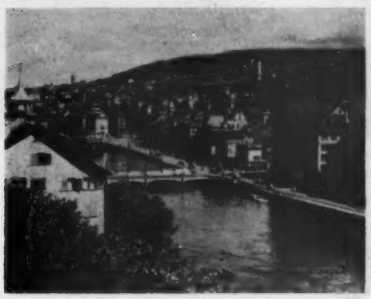
ing groups will be held by special invitations. These groups will work on such subjects as testing cast iron, founding properties of materials, testing of CO_2 materials, foundry clays, and foundry coke. One subcommittee will meet to discuss its work on an international foundry dictionary.

The program includes several visits to foundries and manufacturing plants to give delegates an opportunity to see Swiss facilities for



Limmat River, shown here, is a picturesque Zurich attraction

pressure diecasting, mechanized machine molding, and casting of bells and artistic products. Melting equipment to be inspected includes electric arc furnaces, induction furnaces, and cupolas. Visitors also will see facilities for heat treatment, automatic sand preparation, and coreshooting.

Excursions Planned—Interspersed among the week's meetings, technical sessions, and plant visits are several sightseeing excursions including a cruise on Lake Lucerne. Wives of the delegates will have an extensive schedule of sightseeing including a coach ride to Lucerne and a flight over the Swiss Alps. After the Congress, delegates will have the opportunitv to choose one of three tours of Switzerland, each for three days, which will visit such places as St. Moritz, Lake Como, Berne, and the Swiss Alps.

Officers of the International Committee of Foundry Technical Associations for 1960 are F. W. E. Spies, Netherlands, president; A. Plana, Spain, vice president; M. Vuilleumier, Switzerland, treasurer; and Dr. P. W. Muller, Switzerland, secretary.

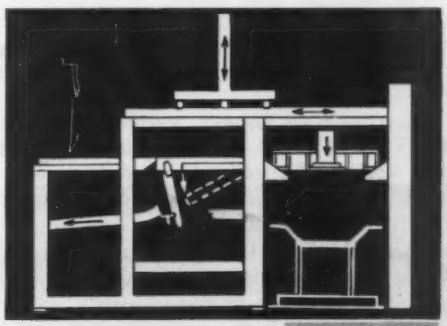
For information, write International Foundry Congress 1960, Postfach HB 2815, Zurich 23, Switzerland.

As seen at the 1960 AFS Convention before installation.

SHAKE OUT TIGHT FLASK MOLDS *quickly and easily* with NOMAD's *NEW* SHAKEOUT-PUNCHOUT UNIT

- ***Features an automatic cycle of approximately 20 seconds! Removes sand and castings from tight flasks.***
- ***Can be made to handle several mold sizes.***

A mold — ready for shakeout — enters this Shakeout-Punchout Unit on the top level of a NOMAD Double Level Track Conveyor. It is pushed onto the vibrating section which vibrates sand and casting out of the mold. At the same time, a punchout cylinder pushes plungers through the barred cope and returns. Vibration stops and the empty flask returns to the pallet. A track section tilts down . . . allowing the empty flask on the pallet to roll off onto the lower return track. The tilting section returns to horizontal or starting position ready for the next unit.



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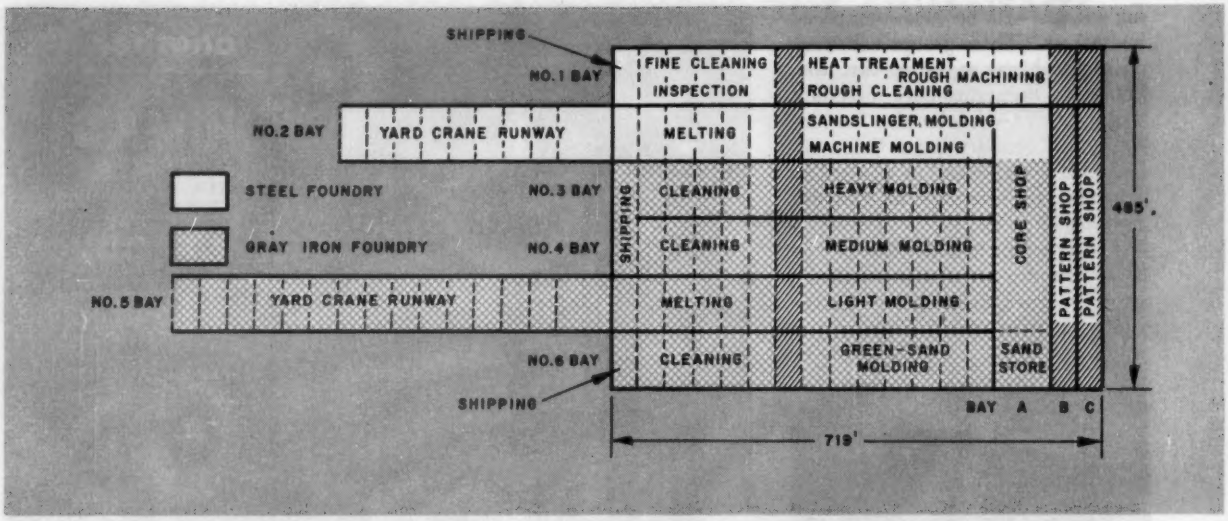
NOMAD EQUIPMENT

Circle 600 on Page 45



Drawing shows allocation of space at Sulzer foundry

Modern Features Characterize New

SULZER BROTHERS FOUNDRY

New Sulzer Brothers foundry at Oberwinterthur, Switzerland, covers 350,000 sq ft and is designed for efficient production of gray iron and steel castings ranging in weight from 200 lb to 120 tons. This article has been condensed from the Sulzer Technical Review

By A. KUGLER and F. EISERMANN

● IN ADDITION to the Winterthur works in Switzerland, founded in 1834, Sulzer Brothers Ltd. since 1907 has maintained a plant at the nearby suburb of Oberwinterthur. It has undergone large-scale development, the latest extension consisting of a completely new foundry with a total floor space of nearly 350,000 sq ft and a heavy machine shop which covers 120,000 sq ft. Castings weighing from 200 lb to 120 tons are produced in the new foundry.

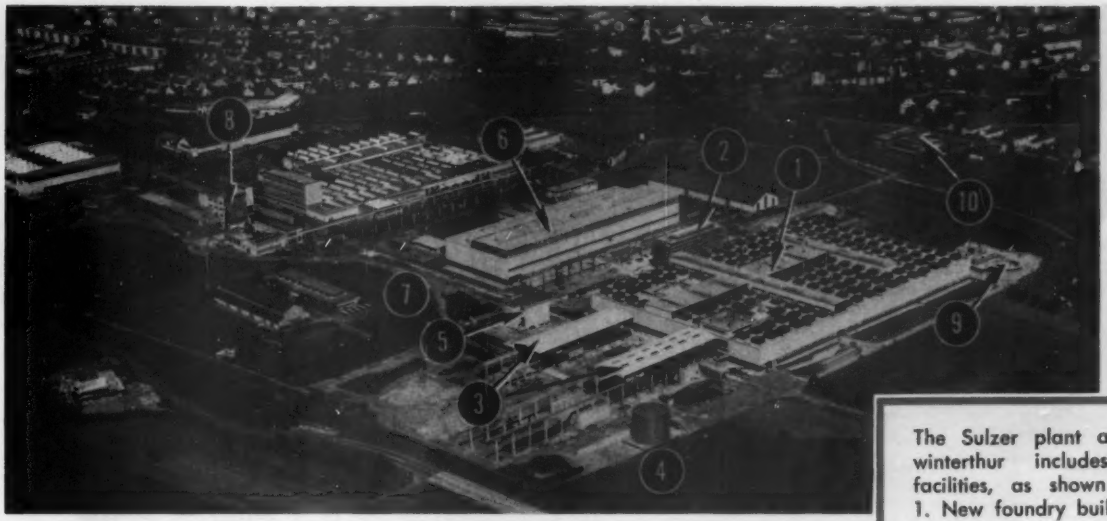
The planning work, down to the layout of the production equipment, was carried out in co-operation with the American consultants, Lester B. Knight & Associates Inc., Chicago.

Standard Flasks and Patterns—Before work could be started on the new plant, it was necessary to standardize pattern plates and flasks. The old foundry had several hundred different types of flasks, which hindered efficient operation, obstructed what should have been production areas, and filled the storage space.

Flasks now consist of a limited number of types. Small and medium-sized flasks are in one piece as before, and larger flasks are bolted together from separate headpieces and sidewalls. This change permits efficient use of individual molding stations, and the total number of flasks can be kept relatively small since rapid turn-around gives maximum use of the available stock. The smallest flask now used is about 17¼ x 22½ in. The largest is 17 x 22 ft.

Increased use of pattern plates, adapted to the standardized flasks, is another important advance. This step was facilitated by the successful reorganization of the pattern shops, in the course of which it proved possible to reduce production costs of pattern plates considerably.

Foundry Layout—The gray iron and steel foundries are housed in a building 485 ft wide and 719 ft long, divided into six longitudinal bays and three transverse bays (Fig. 1). Molding areas are in the longitudinal bays, and the coreroom runs at right angles to them,



The Sulzer plant at Oberwinterthur includes these facilities, as shown above:
1. New foundry building
2. Foundry office building
3. Crane runways
4. Oil storage tank
5. Transformer and distribution station
6. Heavy machine shop
7. Underground pipe duct
8. Boilerhouse and compressed air supply
9. Water purification plant
10. Welfare building

paralleled by two bays which house the pattern shops.

The steel and gray iron melting departments are, respectively, in Bays 2 and 5 (Fig. 1). Cleaning departments for the various types of castings are in the bays in which the castings are molded, except that steel castings are rough cleaned and finished in Bay 1. Heat treatment, rough machining, and inspection operations also are in Bay 1. Bays 2 and 5 extend into the partly covered yard.

Sand Preparation — The sand preparation plant, at the rear of the building, between the molding areas and the coreroom, handles up to 190 tons of sand per hour. About 160,000 tons of molding sand and 12,000 tons of core sand are prepared annually.

The plant is divided into sections which produce sand mixes for cores, steel foundry dry and green sand molds, and gray iron dry and green sand molds. It is supplemented by a sand drying plant and a silica sand reclamation plant, which can handle up to 10 tons per hour.

Molding Sand—Either synthetic or semisynthetic clay-bonded molding sand is prepared, as required.

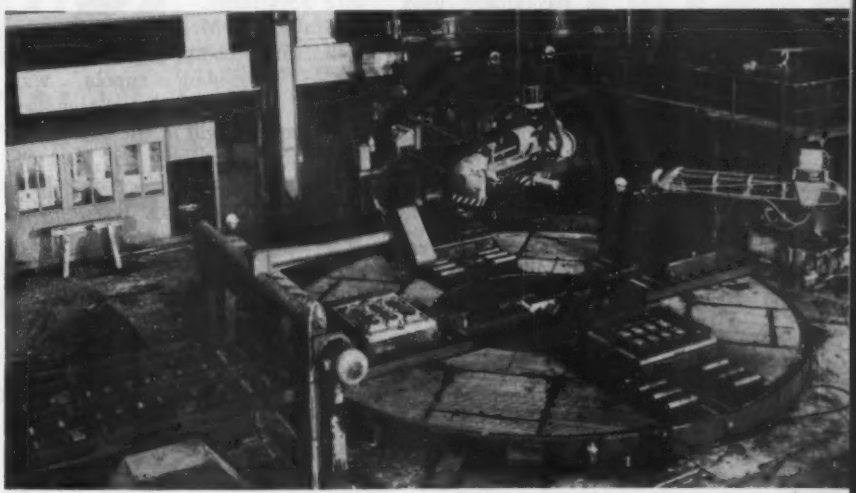
Sand from the shakeout drops through a hopper onto a shaker conveyor, above which a magnetic separator removes iron fragments. From there, the sand passes onto underground return conveyor belts running parallel with the molding lines. These conveyors are completely enclosed to exhaust dust.

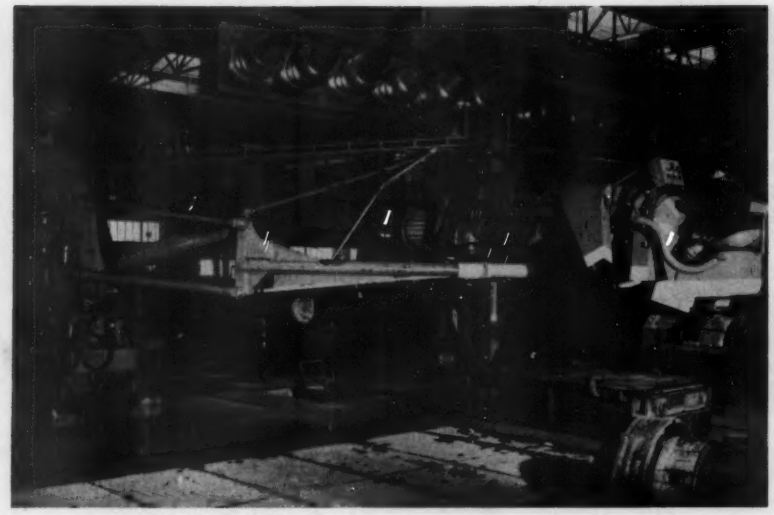
After it has been augmented by strickled sand from the molding stations, this used sand passes through a cooling drum centrifuge, in which particles of iron again are removed, and into a bucket conveyor which raises it to the silos of the preparation unit. After a third removal of tramp iron, it is discharged into the used sand bunker through a shaker screen.

New sand, with or without clay content, according to application, comes from the central drying plant and passes, dry and cooled, via a conveyor belt into the new sand bunkers.

Ingredients are supplied to the mullers by self-controlled trucks or bucket-wheel feeders. Prepared sand mixes are delivered to the stock bunkers of the molding stations via bucket conveyors and belts. They pass through drum centrifuges on the way, as necessary. These preparation processes

View of the turntable, sand filler, sandslinger, turnover machine, and sand cutter in the green-sand molding shop for gray iron





Stationary sandslinger in the molding shop for medium-sized steel castings is supplied sand directly from the sand preparation plant

are under fully automatic control and can be followed by visual indications on a luminous diagram.

Addition of water to the sand is controlled by a unit which measures moisture content of the old sand and allows for temperature fluctuations. This unit automatically maintains the preselected moisture content for the prepared sand within a range of ±0.2 per cent. A powerful cooling unit is combined with the mixers.

To minimize variations in grain structure of the sand, an elutriator has been installed at Oberwinterthur. This equipment, only recently introduced in the foundry industry, permits any grade of sand to be produced; deliveries are graded according to requirements. It also can be used to recondition used sand. Up to 10 tons of used sand per hour can be processed, with the following yields: 5 per cent over 0.051 in. (for use as body sand); 50 per cent coarse foundry sand from 0.013 to 0.053 in.; 35 per cent fine foundry sand from 0.004 to 0.014 in.; and 10 per cent waste dust from 0 to 0.004 in.

A drying plant for new sand precedes the sand preparation units. It loosens up sand, breaks down lumps, removes moisture, and cools sand to room temperature after the drying process. An instrument automatically measures moisture content of the dried molding sand.

New-sand bunkers of the drying plant hold a quantity sufficient for at least one winter.

Core Sand—All core sand mixtures are blended in an area between the two in which molding sands are prepared. Ingredients are brought up by the belt conveyor serving all areas or, as with powdered materials, are charged pneumatically into the bunkers above the mixing platform. Liquid ingredients are delivered later from the stock tanks directly into the mixers by high-pressure pumps.

Ingredients are supplied to the mixers via scales fed by vibrators operating at a variable delivery rate, according to requirements. Water is supplied through flow meters. Finished core sand mixtures are transported to the nearby core department.

Gray Iron Melting — This installation is comprised of a water-cooled, hot-blast cupola with neutral lining, which can be used for either the acid or the basic process, and an uncooled hot blast cupola for the acid process. Both have a blast furnace profile—that is, a conical furnace shaft with a cylindrical lower portion, the hearth. In each cupola, the hearth is 3 ft 7½ in. in diam.

In each, six tuyeres are arranged in the annular hot blast belt. Both cupolas are over 76 ft high, and each has a melting output of 12 tons per hour. A common receiver with 10-ton capacity has been installed before the furnaces.

The plant is regulated and supervised with the aid of numerous instruments fitted in a large control panel on the furnace platform. The blast heating system works on the counterflow principle. Waste gases are led out of the furnace shaft, burned in a combustion chamber, and passed through a recuperator in which their heat is given up to the stream of cold air flowing in the opposite direction. Blast temperatures of up to 1100° F are obtained in this fashion. The hot blast permits metal temperatures of more than 2700° F to be obtained with a relatively small coke charge.

The cupola installation is supplemented by a battery of medium-frequency induction furnaces. This installation is next to the cupolas, in the same bay, and includes one 10-ton capacity furnace, two others of 5-ton capacity each, and one of 2-ton capacity. All operate with a frequency of 600 cps.

The coils of the 10-ton furnace and the two 5-ton furnaces are divided in three sections and the coil of the 2-ton furnace into two, each coil section having a connected load of 800 kw. Division of the furnace coils into sections permits single sections to be switched on or off, or their loads varied, in accordance with melting requirements.

The installation also includes four converter units, each consisting of a medium frequency converter and a converter exciter. The entire melting plant can be supervised from a large control panel. Space is available for a 15-ton crucible furnace as a later extension. Fumes produced during melting are exhausted through slits in the upper parts of the crucibles.

These furnaces are needed when castings weighing up to 120 tons have to be poured or when it is necessary to duplex cupola iron. They also produce various grades of gray iron, especially alloyed qualities, from solid charges. In addition, nodular iron is melted in these units.

Steel Melting—Steel melting facilities include three electric arc furnaces of 3, 6, and 14-ton capacities, with space available for another 14-ton unit. The three furnaces in use are rated, respectively, at 3000, 4500, and 4500 kva. When one is charged, the entire furnace

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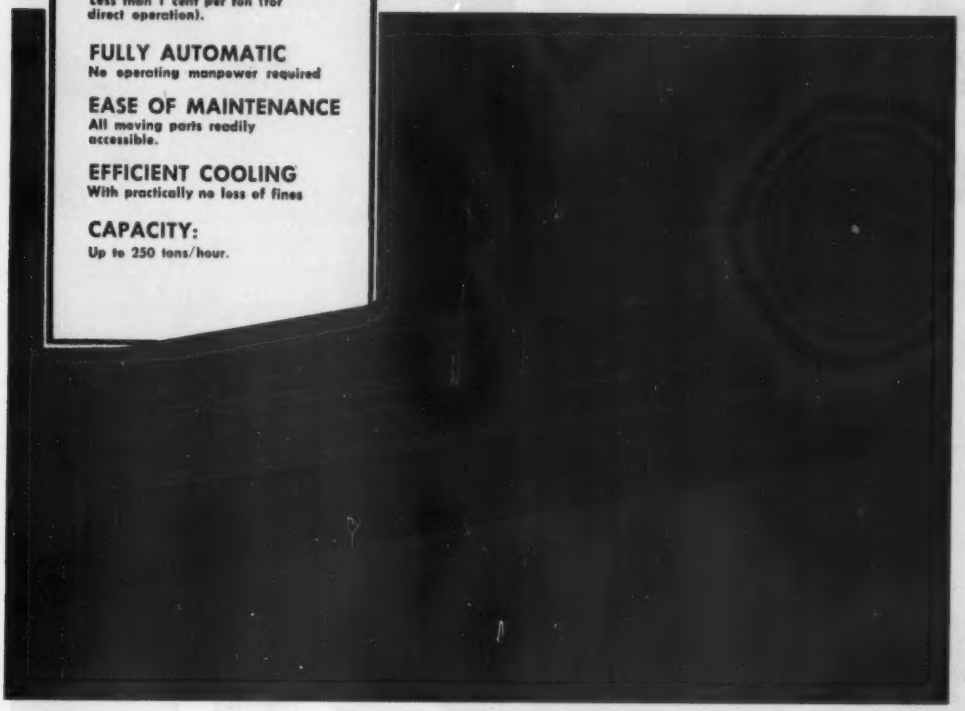

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Save by reducing the use of parting agents.

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Perfect control of molding sand properties is an absolute necessity for any successful molding operation.

Strength, permeability, flowability, etc., must be accurately controlled in the mixing unit and, equally important, these properties must be stable to insure uniformity at the molding stations.

Only the use of a cool sand guarantees stability. Variations in sand properties, caused by varying evaporation of the moisture, are eliminated.

The use of hot molding sand not only causes control loss of sand properties at the molding stations, but is also directly responsible for many casting defects.

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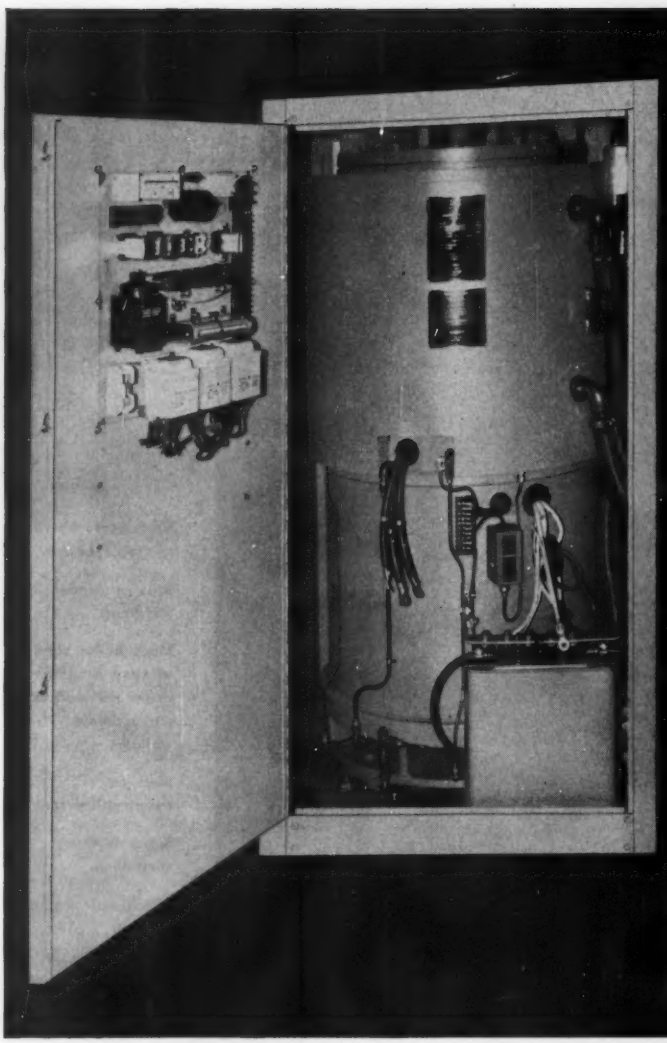

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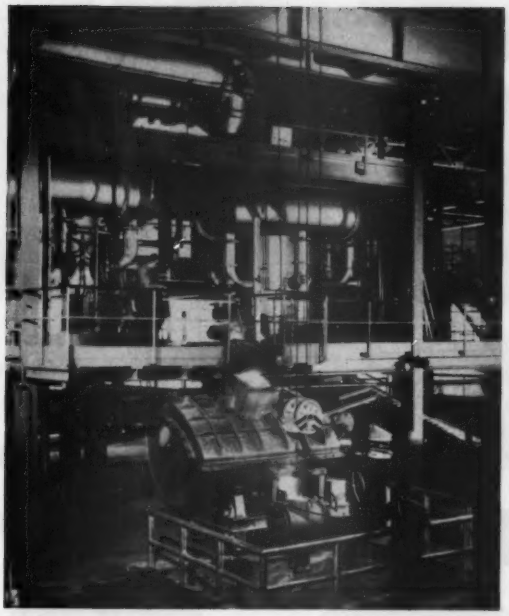


Front view of the cupola installation. The two cupolas and common receiver are shown

cover swings out, and the charging skip full of scrap is emptied into the furnace. Skips are filled outside the foundry, in the scrap yard, and are made ready so that the charge can be brought up on a truck to the furnace crane for emptying as soon as required.

The high electrical ratings insure speedy handling of charges and thereby reduce melting costs. Each furnace has a smoke exhaust hood which prevents virtually any escape of fumes.

Molding—The only molding machines in the new foundry are in the mechanized molding area for light steel castings. All other shops use sandslingers only; five of them handle 3½ million cu ft of sand annually.

The light steel molding uses two jolt-squeeze molding machines with lifting devices, together with a shock-free jolter with a post-type lifter. Tables of the molding machines measure 2 ft 7½ in. by 2 ft 1½ in. and 3 ft 5½ in. x 4 ft 11½ in.

Conveyor belts bring sand straight from the preparation plant to the machines. After the molds have been made, they are placed on roller conveyors and poured. Castings are removed from the sand on a 1½-ton capacity shakeout at the other end of the conveyor. Empty flasks are sent back to the molding station on a roller train.

The sandslinger molding department for steel castings of medium weights produces both dry and green sand molds. Molding sand is rammed in the flasks by a stationary sandslinger supplied with sand directly from the sand preparation plant. Flasks are rolled over by a unit with a lifting capacity of 12 tons. Four ovens designed for surface drying of molds in batches are available.

The heavy molding department serves for both steel and gray iron castings weighing up to 120 tons, all of which are poured in flasks. Three concrete casting pits of various depths have been provided, and a special casting pit is available for cylinder liners. Before pouring, flasks are clamped down with transverse members laid across the flasks and fixed with sprung bolts at the edge of the pit.

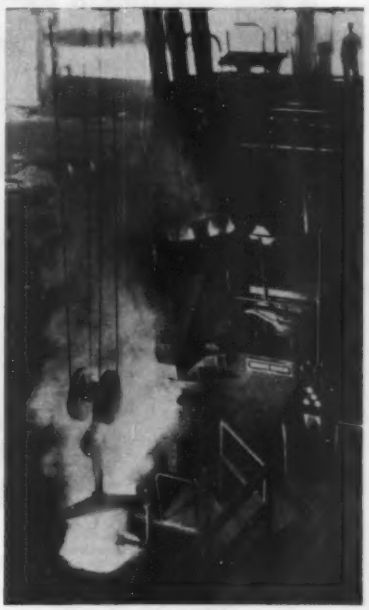
A large, mobile sandslinger is used in heavy molding and travels along the casting pits in the middle of the shop. Its arm has a sweep of 41 ft so that it can cover every part of the molding area. This unit carries an interchangeable sand bunker which is filled directly from the sand preparation plant. Molds are dried by portable driers. The shakeout can handle molds or castings weighing up to 80 tons.

In the molding area for gray iron castings of medium weight, molds are produced with a stationary sandslinger. A rollover machine with a lifting capacity of 21½ tons turns flasks over and draws the patterns. Molds can be dried in either a conventional drying stove or in two intermittent surface-drying ovens situated between the medium and light molding shops to serve either. Portable driers also are available. Flasks are emptied on either the 80-ton shakeout of the heavy foundry or on the light molding department shakeout.

The molding area for light gray iron castings is intended primarily for castings produced in surface-dried molds. Because of the larger number of similar castings turned out by this shop, it was possible to provide more mechanization than in the medium casting molding department.

The molding line is laid out with roller trains in the form of a figure 9. Patterns are fitted in flasks in the head of the 9, and flasks travel around the loop, receiving filling sand at one point and being rammed with a stationary sandslinger at another. At the end of the loop, flasks run onto the straight section of the molding line, where they are rolled over and the patterns drawn.

Molds are dried in eight surface-



Front view of a 3-ton electric arc furnace being tapped

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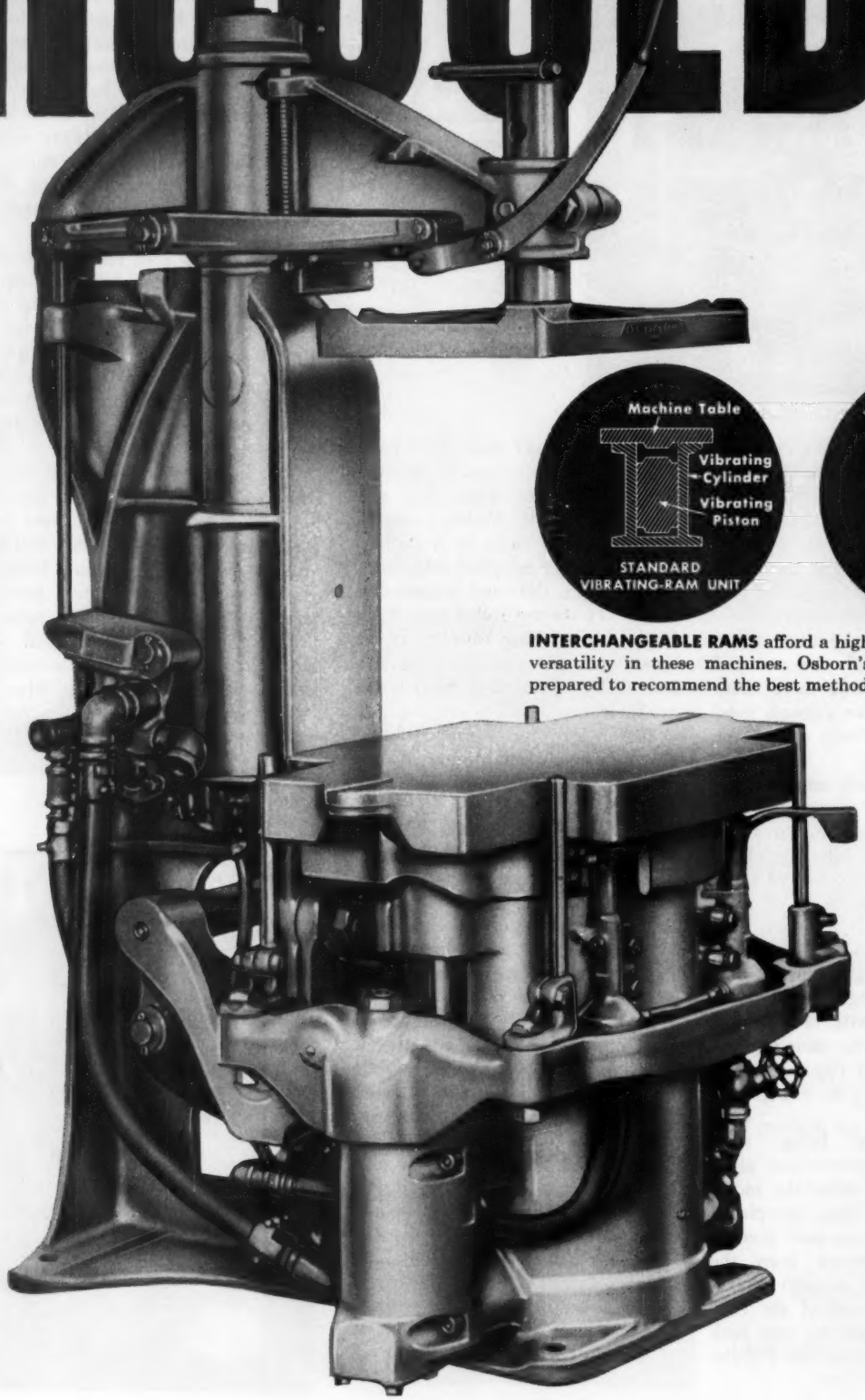

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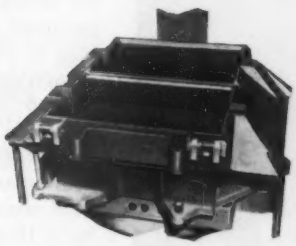

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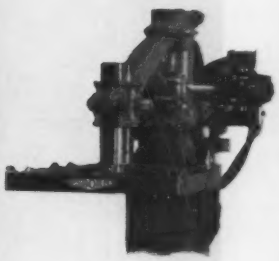

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drying ovens, two of which are of large capacity and also may be used by the medium molding department. A large drying oven shared with the medium molding foundry also is available for conventional drying. Flasks are knocked out in the same bay on a shakeout of 20-ton capacity.

Green Sand Molding for Gray Iron—In the green sand molding department for gray iron, repetitive production has permitted even more mechanization than in the molding of light gray iron castings. Molds are produced by a fixed-cycle system on a turntable which rotates through 90 degrees at each movement. Four stages are involved: 1. Assembly of pattern and flask. 2. Filling with molding sand. 3. Ramming up with a sandslinger. 4. Expulsion of the flasks onto a roller conveyor leading to a rollover machine.

Flasks pass by way of the turning and lifting machines to the casting lines, where they await pouring. After coming from the 20-ton shakeout, empty flasks travel back along a roller conveyor to the vicinity of the turntable, and they are placed on the turntable by a crane.

Shakeouts — Modern shakeouts have been provided for all molding departments in the new foundry. The largest is in four sections and takes molds which weigh up to 80 tons or measure up to about 19 x 24 ft. Three smaller shakeouts are of 20-ton capacity each.

The large unit is mounted on springs and is operated by rotating eccentric weights driven by an electric motor. Vertical lift is 0.3 to 0.4 in., and the machine performs about 1000 strokes per minute. Features of this installation include dust extraction hoods and separators. The smaller units have simple exhaust hoods, in the top of which a horizontal curtain of high-pressure water arrests dust.

Coreroom — The joint coreroom with its attached plant for core sand preparation affords extreme mobility combined with low capital costs for equipment. It includes a section for steel castings and sections for light, heavy, and medium cores. To minimize transport, the individual areas are in the transverse bay in front of the corresponding molding departments. Coreshooters, rollover and lifting machines, sand filling equipment, and bench jolters are used. Many work stations and storage areas are provided for air setting cores.

A rocker conveyor takes core molds to the rollover machine after they have left the sand filler and the bench jolter. If necessary, cores are dried in oil-fired ovens of various sizes which for the most part run under the sand preparation plant and from the coreroom into the individual molding areas. The ovens are charged in the coreroom, and dried cores are taken out on the oven trolley in the molding departments.

Cleaning — All castings are cleaned mechanically—smaller castings in shot blast machines, large castings by a water jet which discharges 63 gpm at 2275 psi. Facilities include the following:

1. A wet cleaning chamber for heavy and medium castings with a working area of 21 x 49 ft which can be divided into two rooms of equal size by double folding doors. Two jet units are mounted in the longitudinal wall, and the casting is mounted on a mechanically driven turntable 14 ft 9 in. in diam with a carrying capacity of 130 tons.

2. A cleaning chamber for medium and light castings with a working area about 20 x 20 ft. This room is equipped with one jet unit. The mechanical turntable is 8 ft 2 in. in diam and has a capacity of 25 tons.

3. A blast plant for light and medium castings with a platform truck and a capacity of 10 tons.

In the wet cleaning, water and dislodged sand drop through gratings into shaker conveyors. Material which cannot be pumped is separated by screens and strip magnets. The mixture of sand and water is pumped into the silica sand reclamation plant.

Individual box-type cleaning compartments of concrete construction also are available. They also serve as supporting structures for the lifting gear of the cleaning department. Runners on steel castings of all sizes are removed with oxyacetylene equipment, which also is used for flame scarfing of castings.

Heat Treatment—The heat treatment plant includes three furnaces with elevating mechanisms 8 ft 10 in. x 15 ft 5 in. x 4 ft 11 in., one furnace with a hearth bogey 6 ft 7 in. x 11 ft 9 in. x 5 ft 10 in., and a bogey hearth furnace 14 ft 9 in. x 36 ft 1 in. x 11 ft 6 in. All are oil-fired. These furnaces are controlled electronically with punched cards in accordance with the heat treatment directives of the metallurgical laboratory.

One of three shakeouts of 20-ton capacity. In the top of the exhaust hood, a horizontal curtain of water under high-pressure arrests dust

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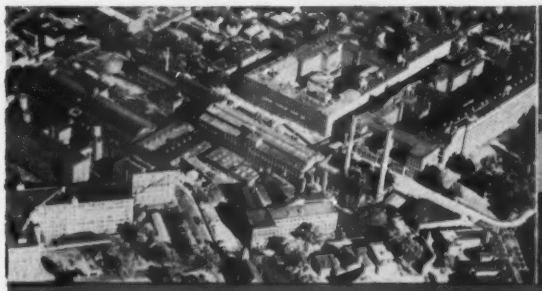

The American Hardware Corp. plant, New Britain, Conn.

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Mr. Francis J. Wolfer, Foundry Superintendent

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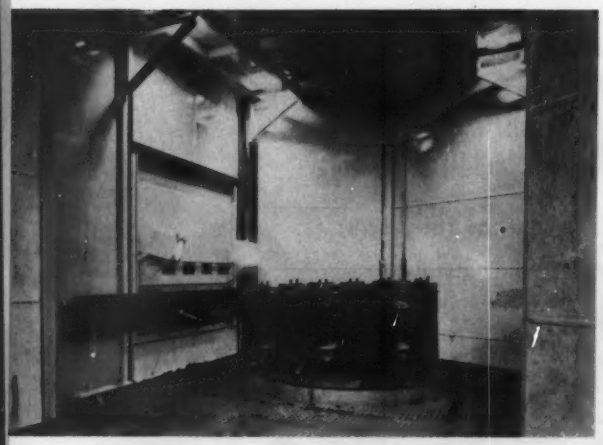


Interior view of the large water-jet cleaning chamber. This is used for both medium and heavy castings

The furnaces can be used for steel, gray iron, or nodular iron. Oil and water baths are provided to quench cast steel.

Raw Material Stocks—Raw material stockyards cover a considerable portion of the foundry area. Apart from the two yard crane runways, under which numerous bunkers are provided for various storage purposes, there are several other storage facilities. Equipment includes a tipping gear for discharging entire freight cars. Fixed or movable conveyor belts speed raw materials to storage.

Quality Control—A wide range of equipment is available for casting inspection.

Various leveling plates with the marking tools required have been provided for dimensional checks. Castings can be tested for leakage or porosity at a number of pressure-testing stands which use water or kerosene at various pressures. Hardness tests are carried out on stationary and portable Brinell presses.

Nondestructive material - testing processes are used extensively. They include both the magnetic particle method and use of ultrasonic equipment.

X-ray apparatus operating on direct current up to 300 kv permits examination of castings with wall thicknesses up to 4 in. Castings of greater wall thickness are irradiated with radioactive isotopes, which are stored in lead containers in an insulated basement. Two isotopes are available—a 4½-curie Cobalt 60 source and a 2-curie cesium source.

Special rooms are provided for nondestructive testing in the fine finishing department of the steel foundry, and casting properties are tested in the material testing department of the central laboratories in the Winterthur works.

Laboratories—A modern laboratory constantly checks the entire sand system. In addition, it carries out experiments with models reproducing actual working conditions and checks test results in practical operation.

Apart from the usual apparatus for determining carbon, a quantometer permits complete analyses of charge samples within a few minutes. A pneumatic tube system takes samples from the melting department to the quantometer.

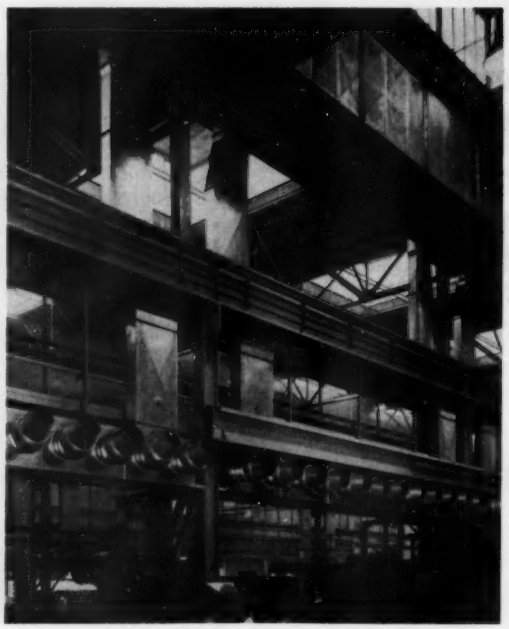
The new foundry also is backed up by the company's central laboratories. Purely practical problems are solved, and research work is carried on in the fields of foundry and materials technology.

Heating and Ventilation—Studies indicated that six changes of air per hour would be necessary in a working zone 20 ft high to achieve the working conditions desired. This goal meant two and one-half changes of air per hour for the entire building, or a maximum air circulation of about 39 million cfph for general ventilation. In addition, separate exhaust points were provided for all concentrated sources of smoke and dust.

In the foundry bays, fresh air is blown into the working zone through adjustable nozzles about 10 ft above floor level. Exhaust air is extracted below the roof and discharged to the atmosphere by large fans in the roof surface. Stacks are mounted on these fans.

Before it is blown into the building, fresh air must be cleaned—and in the winter it must be heated. These operations are performed in a 21 x 39-ft roof superstructure which runs across the bays. Several large fans in this superstructure draw air in through electrostatic precipitators and preheaters and force it into two distributing ducts below the roof. From them, smaller ducts branch off.

Additional air heaters are in-



Air is supplied to the work area through adjustable vents. Above them is the runway for a 40-ton crane

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Circle 606 on Page 45

stalled at the top of the downward branches to the outlet of each individual supply duct for bringing preheated fresh air up to the required emission temperature.

The entire plant is operated from a central control desk so that the available volume of air can be concentrated at points showing the greatest incidence of dust and fumes at a given moment.

Apart from the ventilation system, which also provides air heating for the areas which it ventilates, local heating equipment is installed in parts of the building where there is no dust problem.

Illumination—The problem of illumination required a special solution because of the dust problem. Since no appropriate model was available, a new type of fully enclosed lamp fitting was developed. It uses a fluorescent lamp with a rating of 700 to 1000 w. Heat dissipation through the lamp bowl is enough to keep temperatures within limits at which service life of the lamp is not impaired, and the enclosed design minimizes dirt deposition. The hot glass cover heats the surrounding air so that it flows sidewise and carries smoke and dust particles away from the lamp.

Dust Extraction — As much as possible, dust is exhausted at the points where it is produced. Powerful exhausting equipment is installed at shakeouts, sand preparation, cleaning stations, and melting furnaces. Dust is collected from the air, and gases are exhausted by dry or hydraulic methods, as called for.

Special difficulties are encountered with metallurgical dusts and fumes consisting of particles down to the size of molecules. Even in this field, however, substantial progress has been made, as exemplified by the individual smoke exhausting equipment on the arc furnaces.

Lifting Equipment — Altogether, 31 cranes are installed in the plant, with lifting capacities ranging from 5 to 80 tons. Detailed regulations have been drawn up concerning the standardization of lifting capacities as well as of pulley diameters, etc.

In addition to overhead traveling cranes, smaller units of special types are used. These include semiportal cranes, each serving part of a bay, with capacities up to 10 tons; swiveling bracket cranes serving individual working areas; and air hoists for special duties in working areas, handling small components weighing up to 1 ton.

Foundry Yard — A yard to the south of the foundry serves mainly for storage and prepartion of raw materials.

Rail sidings run into the yard, and its main features are two partially covered crane runways with overhead traveling cranes of 10-ton lifting capacity. Crane runways were constructed of prestressed girders of reinforced concrete. The light roofing consists of a steel framework covered with corrugated asbestos-cement.

The charging crane for the cupolas is freely suspended at the center, and its outer end runs on a circular track. Raw materials are taken from containers around this track and placed on a weighing machine at the center.

The area also contains a large storage space for coke (supplied by conveyor belts from a wagon tipper), an oil tank with a capacity of 1.1 million gal, and open-air storage areas for flasks, scrap, etc.

For an extra copy of this article, until supply is exhausted, use card on Page 45

Cast Bronze Bearing Institute Releases New Bearing Manual

The Cast Bronze Bearing Institute has released a single-volume edition of its new *Cast Bronze Bearing Design Manual.* Originally published serially last year in *Machine Design*, the manual contains the latest theoretical and experimental information on bronze bearing design. It was prepared by Harry C. Rippel, senior research engineer, Friction & Lubrication Branch, Franklin Institute Laboratories for Research & Development, Philadelphia.

Simplified design techniques detailed in the manual are said to eliminate trial-and-error methods and to insure proper design. It is intended to be both a working manual and a reference.

The casebound book has 8¼ by 11¼-in. pages and is available for $2 from the Cast Bronze Bearing Institute Inc., 1604 Chicago Ave., Evanston, Ill.

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Sand packs tight through open coil for rigid support in mold.

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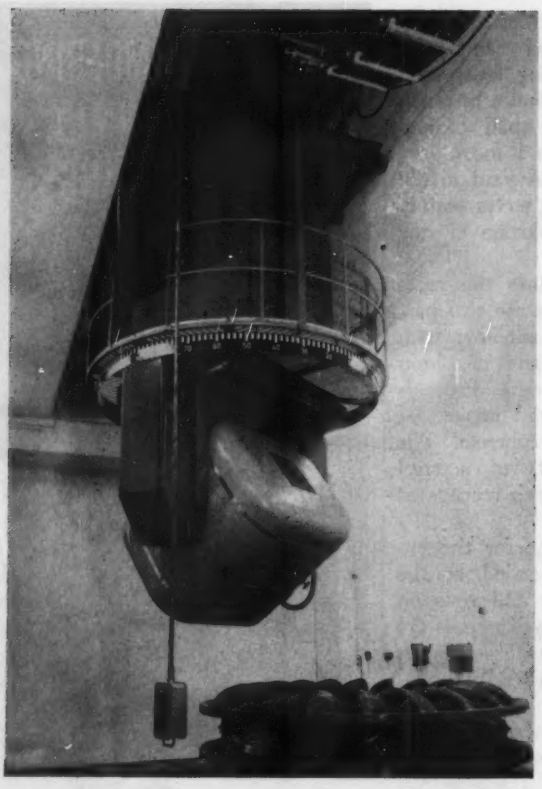
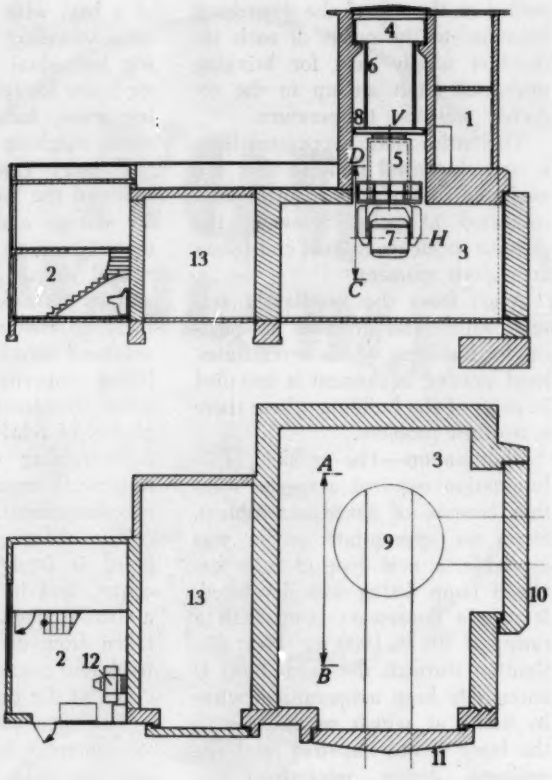


View of part of the Fischer radiation room showing the betatron, control equipment, cabinet, supply cables, and hanging pushbutton station



1. Machine room. 2. Control room. 3. Radiation room. 4. Crane. 5. Housing containing control equipment. 6. Wire rope. 7. Betatron. 8. Hydraulic ram. 9. Turntable. 10-11. Concrete doors. 12. Control desk. 13. Room for x-ray and isotope radiography. A, B, C, and D—Extreme positions of betatron center. H—Horizontal axis of rotation. V—Vertical axis of rotation

BETATRON
Installed in Swiss Foundry

By J. GRINDROD

● A NEW betatron plant has been completed at the works of George Fischer Ltd., Schaffhausen, Switzerland. It is capable of radiographing steel castings up to about 20 in. thick.

Installed by Brown Boveri, the Swiss betatron operates at 31 MeV, the radiation which has been found to have almost the maximum possible penetrating power in iron or steel.

The betatron was installed in a special building containing a machine room, a control room, and a radiation room. The machine room houses the voltage-stabilized converter set for supplying the plant with 380-v three-phase power, the 6-kv transformer, and the 1000-kVar bank of capacitors. Operation of the betatron can be supervised from the control room.

The betatron itself and the impulse-generating and orbit-expanding equipment are situated in the radiation room. The 38 x 27-ft floor space and 16-ft ceiling height of this room enable practically any casting from the George Fischer steel foundry to be radiographed.

Suspended from Crane—The betatron is suspended from a crane and is capable of the following movements for the purpose of aiming the radiation: Horizontal movement parallel to the longer walls of the room; vertical movement; rotation about the vertical axis through a total angle of 180 degrees (a total movement of 360 degrees, though easy to provide, was considered unnecessary and would have added to the cost of shielding); rotation about the horizontal axis from +35 to −95 degrees, 0 degrees corresponding to horizontally aimed beams.

Above the betatron is a cabinet which contains the equipment for generating the injection and expansion impulses and for raising and lowering the electron orbit. Some 22 cables of various types—single core, multicore and high-frequency—carry current to the betatron and are arranged in the form of a flat, flexible band. Four wire ropes are

Circle 608 on Page 45→

The FLEXIBLO Picture at Farrell-Cheek Steel Company Shows...

- ***CB5C FLEXIBLOS*** providing four times greater production than hand methods . . . 20% greater production than previous blower.
- ***CB10C FLEXIBLO*** providing up to seven times more production than previous methods.
- ***CB12C FLEXIBLO*** providing up to five times more production than previous methods.

All with a 30% manpower reduction!

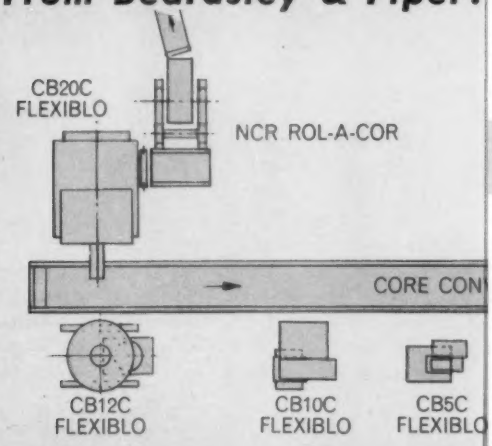
In addition, a CB20C FLEXIBLO and NCR ROL-A-COR team is now being installed to produce their largest cores at typical Flexiblo savings.

WHY FLEXIBLO?

Exhaustive comparison of all available core blowers convinced Farrell-Cheek that the Flexiblo line would most effectively cut soaring core room costs . . . and without modification of existing wood and metal core box equipment.

Management's appreciation of dependability and quality is reflected by their continued use of B&P equipment. Beardsley & Piper's extensive engineering facilities and knowledge of modern foundry requirements assures you that B&P equipment will accomplish *your* job better, faster and at the lowest possible cost.

From Beardsley & Piper.



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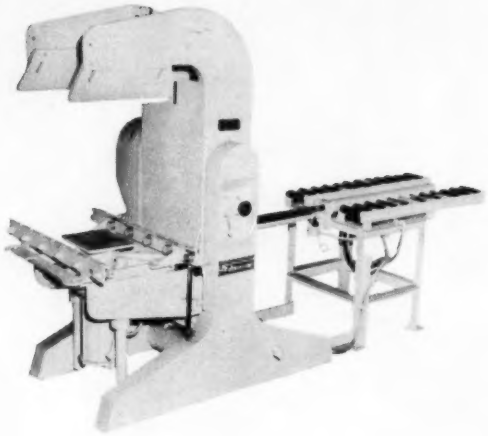
NEW CORE ROOM EFFICIENCY. . . Your Bonus From B&P Research

Fastest Core Handling– Most Accurate Draws

Jobbing and production foundries alike cut core room costs to the minimum with B&P ROL-A-CORS.

The NCR ROL-A-COR is especially designed to handle the cores produced on the large Flexiblo Core Blowers. Exceptional flexibility makes the NCR ideal for work of a jobbing nature. Cores can be rolled in and out of the NCR in any combination of 90 or 180 degrees. An extremely rigid draw mechanism and one piece steel side frame and base assure years of accurate, trouble free service.



The trunnion type TR ROL-A-COR provides outstanding efficiency for high speed core production. Uniformity and high quality is assured cycle after cycle through automatically controlled operation . . . no need for a skilled operator. One core is blown while another is rolled over . . . a single push of the control button completes the cycle. The TR ROL-A-COR is the perfect core rollover unit to team with highly productive Flexiblos for the ultimate in core room efficiency.

Speed Co_2 Coremaking

The CO_2 process can now be used with a wide range of core boxes on a *real* production basis. The FG 12-20 Flexigas can be teamed with the highly productive CB12, CB15, CB18 and CB20 Flexiblo Core Blowers to provide completely cured cores automatically, in short gassing cycles. The FG 12-20 can also be combined with the FG 5-10 Flexigas to efficiently gas a wide range of cores. Flexigas units are push button controlled and have a simple, maintenance free, all pneumatic control circuit. An optional roller conveyor frame makes the handling of large core boxes easy. Two types of automatic Horizontal Clamps are available for gassing vertically-parted core boxes.

FG 5-10 Flexigas units (not illustrated) provide a new standard of efficiency in the production of small CO_2 cores. Two FG 5-10 gassing machines teamed with a CB5 Flexiblo produce completely cured CO_2 cores at oil core production speed.

BEARDSLEY & PIPER CORE ROOM EQUIPMENT INCLUDES: FLEXIBLO CORE BLOWERS • SAN-BLO CORE BLOWERS
NCR ROL-A-COR • TR ROL-A-COR • FLEXIGAS • SPEEDMULLOR • MULL-ALL • MULBARO • WHIRLMIX • WONDER WIRE CUTTER
• CLIMAX WIRE STRAIGHTENER • VIBRA DRAW

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used for suspending the betatron and cabinet from the crane.

Rams Steady Beam — While a radiograph is being taken, hydraulic rams grip the walls of the radiation room and hold the betatron steady. Components for testing are loaded onto a specially constructed railway car and conveyed through one of the two large doorways of the radiation room and onto a power-operated turntable. All the controls necessary for positioning the component and betatron are conveniently grouped together on a hanging push-button station, thus providing centralized control.

No dangerous radiation can escape through the walls of the radiation room. Those that may lie, on occasion, directly in the path of the beams must be capable of reducing the radiation intensity from about 250 roentgen per minute, which occurs at 1 m from the target when the equalizing filters are removed, to 3 milliroentgens per hour. Even with barite concrete (density about 3.5 grams per cu cm), wall thicknesses varying from 23 to 45 in. were necessary, depending on the distance from the targets and the angle of incidence of the rays. The doors, which open to allow the transport of test objects to and from the room, weigh 150 and 70 tons, respectively.

Fast neutrons are also produced by the betatron, and the walls had to be designed to reduce the intensity of neutron as well as gamma radiation, the maximum permissible number of fast neutrons (energy greater than 2 MeV) being 30 per sq cm per second.

Nobody is allowed inside the radiation room when the betatron is working. Warning lamps are installed inside and outside the room, yellow lamps indicating that the magnet is switched on and red lamps that radiation is in progress. Furthermore, radiation can only take place when both doors are closed, the action of opening a door causing the beams to be switched off automatically.

Radiographs are taken on x-ray film sandwiched between 3-mm thickness of lead foil at the front (i.e. between the film and the test object) and 1 mm at the back. Secondary electrons (Compton electrons and electron pairs) produced in the lead by the action of the gamma rays greatly accelerate the blackening of the film. At the same time, the lead absorbs secondary electrons originating in the test object which would otherwise fog the film.

Cutting Exposure Time — Exposure time for a very thick object can be reduced if two or even three films are exposed simultaneously. Each of the resulting radiographs will be of approximately the same density and quality, the density being weak on account of the reduced exposure time. If, however, they are viewed superimposed, the density is doubled or trebled and in this way they can be conveniently scrutinized. Exposure time depends on the target-to-film distance, the material and thickness of the test object, the primary intensity of the betatron radiation, and the film quality.

Wire or step penetrameters are used for measuring fault sensitivity.

Broad-beam and stereoscopic radiography can sometimes be used for reducing the time required for certain types of examination.

Investment Casters Society Nominates New Officers

At the April 19 meeting of the Investment Casters Society, Los Angeles, officers for the coming year were nominated. Nominations include Allen Smith, Picco Inc., chairman of the board; Myron Orbaugh, Bone Engineering, president; George Warde, Arwood Precision Casting Co., vice president; Joe Demeter, Rex Precision Casting Corp., director; Frank Taylor, Joseff, director; and Dick Ells, Dick Ells Co., secretary-treasurer.

Book Review

Techniques of Office Cost Control, **paper, 110 pages, 6 x 9 in., Management Report 26, published by American Management Association, 1515 Broadway, New York 36. Price $3.**

The material in this publication is based on papers presented at the fall 1958 office management conference of the AMA. Leading companies discuss how their office management practices have reduced and controlled office costs. The presentation includes how to reorganize office operations for greater efficiency, how to modernize clerical procedures, and how to reduce paperwork costs.

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Sturdy steel hinged case with aerosol spray cans of PIXchek Dye, Cleaner, and Developer, plus extra cans of Dye and Cleaner for brush and wipe-on applications. The coupon below can start you flaw hunting right away.

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Circle 609 on Page 45

Industry Briefs

Fall River Foundry Co., Fall River, Wis. has purchased Harsch-Ebaloy Foundries Co., Rockford, Ill., from Berliana Corp., Chicago. The 100,000-sq-ft plant, which was closed last May, will be operated as a jobbing shop and is expected to employ up to 150 workers eventually.

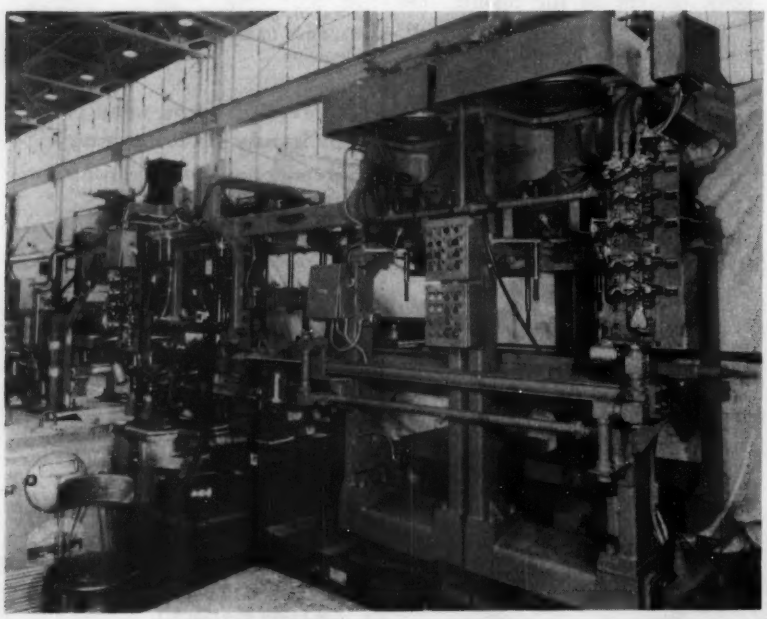
Bohn Aluminum & Brass Corp., Detroit, is closing its plant at 2599 Twenty-Second St. because it is obsolete. All permanent mold operations formerly performed there will be transferred to other Bohn plants in Michigan and in Indiana.

Colorado Conversion Co., La Junta Municipal Airport, La Junta, Colo., has been incorporated as a foundry with $45,000 capitalization. A 24,000-sq-ft building is being constructed.

Centrifugally Cast Products Div., Shenango Furnace Co., Dover, Ohio, has completed a plant improvement and expansion program totaling nearly $\$1/2$ million. Started in 1958, the program included equipment additions and relocations, enlarged research and testing facilities, general office modernization, and a new shipping building.

Rudisill Foundry Co.'s No. 2 plant, Anniston, Ala., was gutted by fire which occurred when a ladle of molten iron overturned into a dip vat of tar. Two other Rudisill pipemaking plants in the vicinity were not damaged.

Ransohoff Co., Hamilton, Ohio, has appointed Earle C. Call & Associates to be its sales engineering representative in the San Francisco area.



SOLD TO RENAULT: The completely automatic molding line shown here was shipped last month to the Renault auto company's foundry in Le Mans, France, by Osborn Mfg. Co., Cleveland. It is designed to make at least 300 molds per hour and is expected to produce as many as 400 hourly, chiefly for brake drum and flywheel castings. Flask size is 26 x 26 x 12 in. The line weighs 60 tons and is said to be the first full production line shipped from Cleveland to Europe by way of the St. Lawrence Seaway. It will replace three existing lines at Renault and is scheduled to be ready for operation by Sept. 15

Grede Foundries Inc., Milwaukee, has purchased the land and building of Economy Concrete Products Co., Milwaukee for $205,000. No immediate plans have been announced for the property, which is adjacent to the firm's Liberty Div.

A-1 Pattern Co., Lakewood, Colo., is being incorporated to carry on the making of wood, metal, and plastic patterns.

Reid-Holcomb Co., 1815 Kentucky Ave., Philadelphia, has formed a new Industrial Truck Div. to handle products of Yale Materials Handling Div., Yale & Towne Mfg. Co. A full line of industrial lift trucks will be handled by the new division.

Dayton-Portsmouth Foundry Co., Portsmouth, Ohio, is completing an addition of 2400 sq ft at a cost of $20,000. The additional space will house new centrifugal casting equipment.

H. Fischer & Associates, Cleveland, has purchased May-Fran Mfg. Co., Cleveland, manufacturers of steel belt conveyors and conveyor components. No change in management is anticipated.

Brown Fintube Co., Elyria, Ohio, has formed a wholly owned subsidiary, Brown Aluminum & Chemical Co., to specialize in chemical uses of aluminum for the basic steelmaking, stainless steel, and foundry industries. Products will include shot, cylinders, bars for the purification and deoxidizing of steel.

Kaiser Aluminum & Chemical Corp., Oakland, Calif., has appointed Charles Batchelder Co., Botsford, Conn., to be an ingot distributor.

Alu-Bra Foundry Inc., Bensonville, Ill., has been purchased by Jack Palmer and Emmett Torkelson, who will serve as president and secretary, respectively. Facilities

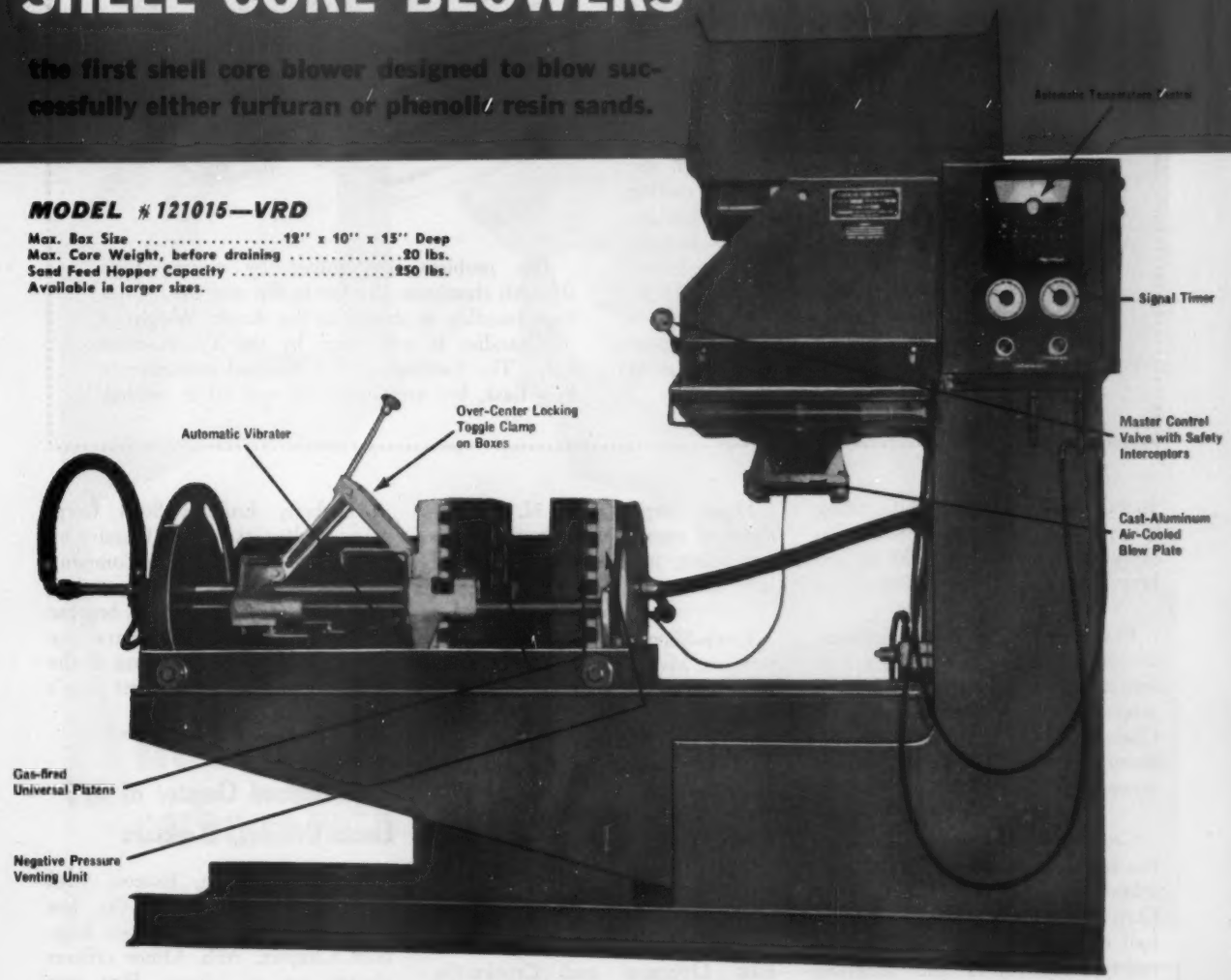
A dramatic advancement for the foundry industry:

DEMMLER "Utility" Semi-Automatic SHELL CORE BLOWERS

the first shell core blower designed to blow successfully either furfuran or phenolic resin sands.

MODEL # 121015—VRD

Max. Box Size .....12" x 10" x 15" Deep
Max. Core Weight, before draining .....20 lbs.
Sand Feed Hopper Capacity .....250 lbs.
Available in larger sizes.



MORE FOR YOUR FOUNDRY DOLLAR

TYPICAL CORES SUITABLE FOR PRODUCTION ON THE "UTILITY" SHELL CORE BLOWER.

OPERATING FEATURES:

1. Sand fed automatically from feed hopper into blow magazine. Hopper can be replenished without stopping production.
2. Over-center toggle lock for positive box closing and opening.
3. Master control lever shuttles box under blow head, clamps it, blows, unclamps and shuttles box to rollover drain position.
4. Rollover designed so that weight of boxes remain within the radius of rotation . . . no out of balance weight to struggle with.
5. Vibration applied to boxes automatically in rolledover drain position for consistency of core wall thickness.

DEMMLER MANUFACTURING COMPANY • KEWANEE, ILLINOIS

Circle 610 on Page 45

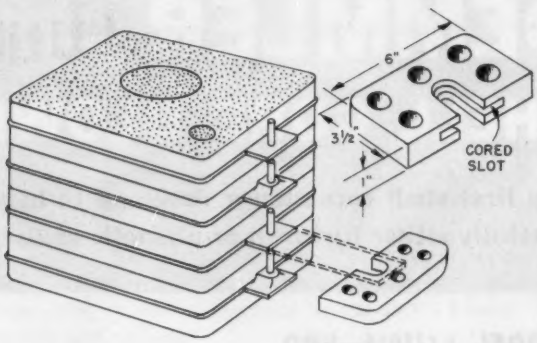
HOW To Do It

FOUNDRY will pay a minimum of $15 for each "How To Do It" idea submitted and published

Slip-on Flask Handles Aid Molders in Stack Molding

By FREDERICK W. SCHAEFER
Richmond Hill, N. Y.

MOLDERS in small jobbing shops often use ordinary flasks to make stacked molds for casting long bushings or similar castings in an upright position. It is not uncommon for cheek sections 12 in. high to be lifted. They are quite heavy, and the small handles of an ordinary 12 x 16-in. flask offer little hand hold. Molders complain about cramps in their fingers, leading to poor lifts, plus the ever-present risk of dropping a mold section.



The problem was solved by casting high strength aluminum handles to slip over the regular flask handles, as shown in the sketch. Weight of the handles is minimized by the 1¼-in.-diam holes. The handles are not attached permanently to a flask, but are slipped on and off as needed.

include 6000 sq ft of manufacturing space and equipment to make aluminum castings up to 500 lb and brass castings as large as 800 lb.

Eastern Gas and Fuel Associates, Boston, have offered for sale a 166-acre tract of waterfront industrial property in nearby Everett and Chelsea. It was the site of a merchant coke and manufactured gas plant until April 30.

Crosby Foundry Sales, Cleveland, has been appointed exclusive representative of Nomad Equipment Corp., Milwaukee, for the northern half of Ohio. Nomad manufactures rail-type conveyors and shakeout equipment.

Henes Precision Tool & Casting Co., Phoenix, Ariz., has changed its name to Henes Mfg. Co.

Eric P. Cahn, 225 Lafayette St., New York 12, has been appointed sole importer and distributor in the United States and Canada of VWF diecasting machines, manufactured in Frankfurt, West Germany.

Wisconsin Centrifugal Foundry Inc., Waukesha, Wis., has acquired Wisconsin Stainless Foundry and Machine Corp., also of Waukesha, and will operate the firm as its Stainless Division.

Hysol Corp., Olean, N. Y., producer of epoxy resin compounds, is expanding its manufacturing and laboratory work areas by one-third.

Lewis-Shepard Products Inc., Watertown, Mass., has appointed Gardner's Sales and Service, 4029 E. Main St., Columbus 13, Ohio, to be its sales and service representative in the Columbus territory.

Refractories Div., Ferro Corp., Crooksville, Ohio, will build a $300,000 plant in the Los Angeles area to manufacture a line of refractory specialty items now produced in the division's plants in East Liverpool and Crooksville, Ohio.

Harnischfeger Corp., Milwaukee, has appointed Maquinas y Herramientas Sabin St. Germain S.A., Marsella y Dinamarca No. 72, Mexico 6, D. F., Mexico, as distributor of P&H electric hoists and overhead traveling cranes in the southern portion of Mexico.

Briggs-Shaffner Co., Winston-Salem, N. C., has installed a 400-ton aluminum diecasting machine capable of producing diecastings weighing up to 5 lb. It will supplement the firm's nonferrous foundry, machine shop, and anodizing operations.

Allegheny Ludlum Steel Corp. plans to close its Buffalo foundry by the end of the year. The company said its wage costs are out of line with those of its competitors because it has been unable to have the foundry excluded from terms of the agreement which ended last year's steel industry strike.

New England Chapter of AFS Elects Officers, Directors

Philip C. Smith, Everett Steel Foundry, General Electric Co., has been elected president of New England Chapter, AFS. Other officers elected are as follows: First vice president, Lewis W. Greenslade Jr., Brown & Sharpe Mfg. Co., Providence, R. I.; second vice president, Harry K. Sleicher, Seaboard Foundry, Johnston, R. I.; secretary, Daniel J. Pendergast, Sterling National Foundries, Boston; and treasurer, Thomas I. Curtin Jr., Waltham, Foundry Co., Waltham, Mass.

New chairman of the publicity committee is John Orrock, Debevoise-Anderson, Boston. He succeeds Fred S. Holway, Mystic Iron Works, who has been transferred to Pittsburgh by Eastern Gas & Fuel Associates. At the annual meeting Mr. Holway was a special guest and was presented with a set of golf clubs by the chapter.

Stub at left shows average waste with conventional cutting carbons; piece at right shows small amount of waste with Kostkutter Rods.

"We save 20 to 25% over conventional cutting carbons with Speer's new KOSTKUTTER RODS*"

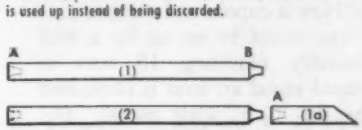
says Benjamin Desper, Cleaning Room Foreman, Atlantic Steel Castings Co., Chester, Pa.

You can save money too! The revolutionary design of Kostkutter Rods, a Speer development, allows the joining of the normally discarded 2½ to 3 inches "waste" to the front of the next rod for further use. Additional savings are realized due to reduced torch damage. It is no longer necessary to economize by burning carbons close to the clamp, bringing the torch too near the hot spot. Additional "left over" carbon is used up with the next rod. This virtually eliminates stub loss. It is important to note that Kostkutter Rods are copper plated (except for the tapered sections) after shaping the rod ends, thereby insuring perfect contact between rods.

Kostkutter Rods are available only from Speer. Buy them in diameters of ½", ⅝", ¾" and 1". Standard cutting carbons are also available at slightly lower prices.

How Kostkutter Rods Save You Money

Each Kostkutter Rod has a tapered hole in one end (A) and a tapered projection at the other end (B) as shown in Diagram 1. The rod is clamped into the torch and used in the normal way. The stub end (Diagram 1a) which, with conventional cutting carbons would be wasted, is removed from the torch and attached to the end of a new Kostkutter Rod (Diagram 2). The tapered end of the new rod slips easily into the tapered hole at the end of the stub and is held firmly by friction. The new rod, with the stub attached, is then clamped into the torch and practically the entire stub is used up instead of being discarded.



SPEER Carbon Co.
Carbon Products Division • St. Marys, Pa.

*Patent applied for

Circle 611 on Page 45

Foundry Developments

By EDWIN BREMER

Metallurgical Editor

Aids Disintegration

OUR British contemporary, *Foundry Trade Journal*, mentions the development of an additive for application in the carbon dioxide-sodium silicate process which is said to aid in breakdown of the mold or core without any adverse effects on green and gassed strengths of the sand.

The material is based on pelleted ammonium chloride, and is added to the extent of 1 to 1½ per cent by weight. The compound was developed by Distillers Co. Ltd., and it is reported that it is being evaluated by some foundries and research organizations in Britain.

Sigma Phase

BOOKLET containing eight pages on "Sigma Phase in Austenitic Stainless Steels" has been prepared by Electric Steel Foundry Co., 2141 N.W. 25th Ave., Portland 10, Oreg. The booklet discusses the nature and occurrence of the sigma phase, its chemical composition, identification, effect on mechanically stressed parts, and corrosion rate as well as its use in special applications.

Cast Iron Refining

REPORT on "Refining Method for Cast Iron by the Electrolysis of Slag," M. Homma, Y. Hashimoto, and A. Minato appears in *Science Reports of the Research Institutes*, Tohoku University, Sendai, Japan. It is indicated that with sodium chloride and lime-alumina-silica slags, the structure of the treated iron shows spheriodal graphite and fine granular graphite. With calcium chloride, sodium silicate and potassium silicate slags, the structure of the iron shows fine granular graphite.

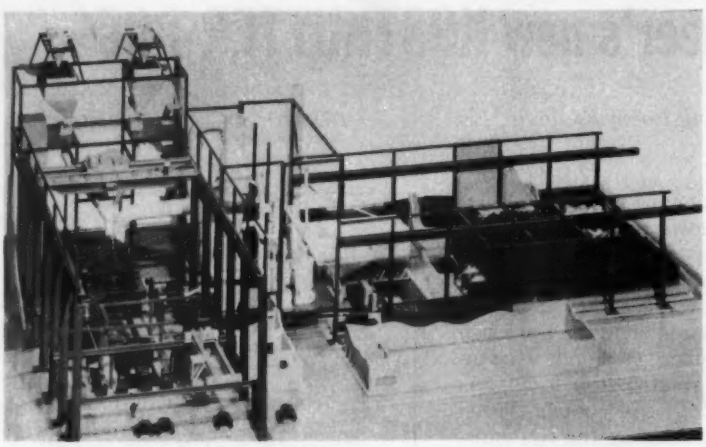
Electrolysis was conducted at 1250 to 1350° C with a voltage of 5 to 9, current density from 0.12 to 0.5 amp per sq cm, for periods of 10 to 40 minutes. Positive potential was applied to the slag and the negative to the iron.

Withstands Heat

DEVELOPMENT of a new high-temperature alloy for use at temperatures up to and including 2300° F is reported by Electro-Alloys Div., American Brake Shoe Co., Elyria, Ohio. Base composition of the alloy shows 26 per cent chromium, 35 per cent nickel, 1.60 per cent Si, 0.50 per cent carbon, and 0.70 per cent max manganese. That composition is strengthened and stabilized with cobalt and tungsten additions, but details on the amounts of those are not indicated.

It is said that the tensile strength at 2300° F is 2100 psi, yield strength 1500 psi, elongation 50 per cent, and reduction of area 65 per cent. Stress for rupture in 1000 hours is 150 psi. Oxidation resistance is 0.044 in. per year.

Steel Foundry To Use Cupola-Oxygen Converter



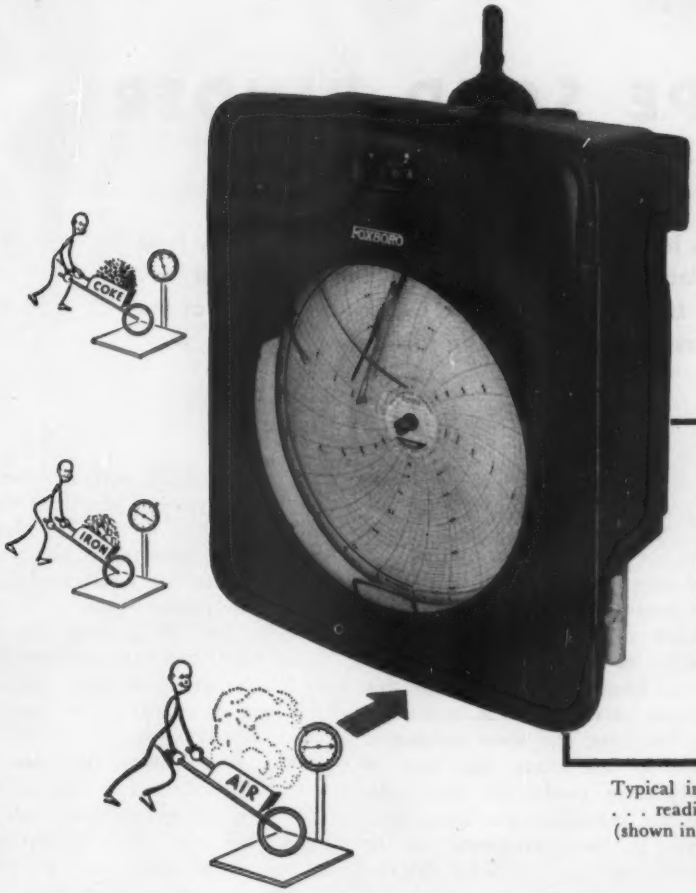
How a cupola and oxygen converter could be set up for a steel foundry requiring 15 tons of liquid metal an hour is illustrated by this ⅛-in. scale model. Designed by Lester B. Knight & Associates, Chicago, the proposed melting facilities include a cupola and oxygen converter for duplexing and an electric furnace for triplexing of special alloy steels. Neutral lined, the cupola has water cooling and is equipped with hot blast.

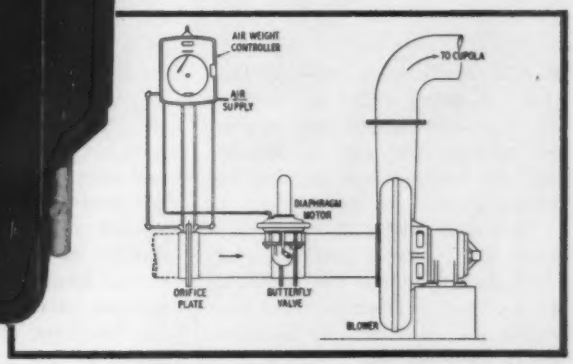
Typical cupola charge is equal parts of No. 2 heavy melting steel, No. 2 bundles, and turnings and borings. Borings can be increased to 50 per cent. The resulting 3.8-4.2 per cent C iron is charged into the 12 to 15 ton converter with 25 per cent cold scrap, and a heat is produced in 40-50 minutes tap to tap. Heats are slagged twice, with about 30 per cent of the first slag remaining in the vessel for the second slag, and 75 per cent of the second slag forming the first slag of the next heat.

Cold charges are made up in boxes on transfer cars, delivered to the converter bay, and charged by crane. Charges of flux, borings, etc., stored in overhead bins, are made up in remote controlled weigh hoppers and delivered by chute.

Ladles of finished steel are moved by transfer car to the pouring bay.

Simplest Efficiency-Booster you ever saw!





Typical installation of Foxboro Air Weight Control . . . readily adaptable to either a centrifugal blower (shown in diagram) or a positive displacement blower.

Controlling cupola blast by **weight of air** cuts pigging, ups quality, gives uniform pours

There's no longer any need to let the weather upset your cupola operation. With a Foxboro Air Weight Controller you can get uniform pours, *every day*.

The Foxboro Air Weight Controller automatically and precisely controls cupola air blast by weight — delivers the correct amount of oxygen for the quantity of coke in the charge. Regardless of ups and downs in atmospheric pressure or temperature, this simple, inexpensive accessory compensates for every change — insures better combustion, more uniform heats, and saves pigging.

All you do is set the control pointer before you start the run. No further attention is necessary. Air weight is held constant as long as desired, or may be changed instantly for pours of different composition. Installation on your present blowers easily made by an experienced pipefitter.

Foxboro Air Weight Controllers are used by more than 1000 foundries. Write for Bulletin 10-10. The Foxboro Company, 328 Neponset Avenue, Foxboro, Massachusetts, U.S.A.

FOXBORO AIR-WEIGHT CONTROLLERS

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Circle 612 on Page 45

Furfuryl Alcohol Is Base for . . .

NEW TYPE SAND BINDER

Experimental work has been conducted for some time with a new type of sand binder, the principal ingredient of which, furfuryl alcohol, can trace its ancestry back to the lowly corncob. General properties of the binder and how it is used are described in this article

● ANOTHER new type of sand binder is being added to the long list of products which have resulted in startling changes in foundry molding and coremaking practices during the last 15 years.

This new binder is based on a relatively common product — furfuryl alcohol—which has been used for a variety of other purposes since it became commercially available about 25 years ago. Furfuryl alcohol is one of numerous derivatives of furfural, a product obtained from corncobs, cornstalks, straw, oat husks, and peanut shells.

Furfuryl alcohol resins, made by reacting with an acid catalyst, are liquid materials that are low in cost and highly chemical resistant. They are widely used for protective coatings, tank linings, and chemical-resistant cements.[1]

The solvent applications of furfuryl alcohol include use as an ingredient in the solvent portion of synthetic resin solutions, as a solvent for dye solutions in textile printing, and as a reactive solvent with urea and phenolic resins. In the manufacture of resinoid abrasive wheels, furfuryl alcohol serves not only as a solvent for the fusible phenolic resins employed as binders, but also as a reactant with these binders during the curing step. It is also used as a reactive solvent in the manufacture of adhesives based on urea-formaldehyde resins.[2]

Applications Vary — Various desirable properties of furfuryl alcohol prompted investigation of its use as an ingredient in foundry sand binders. Several different applications were developed; one of the latest—and the one with which this article is concerned—is the use of furfuryl alcohol resins for high-speed production of cores in hot coreboxes.

The formulas developed for this purpose have been tested in numerous foundries, and some automotive foundries are using this type of material in production operations. Various manufacturers have been active in the development of the binder, and the following description of its properties and application is based on information supplied by the Archer - Daniels - Midland Co., Cleveland, the Aristo Corp., Detroit, and Quaker Oats Co. Chemicals Dept., Chicago. There are, however, certain differences in properties of the various companies' products.

Two Materials—The binder consists of two liquids—a furfuryl alcohol resin and an acid catalyst. Sand is prepared in a conventional muller, and the catalyst first is added to dry sand and mulled for two minutes or less. The resin then is added and mulling is continued for two to three minutes. Mulling should not be continued long enough to develop any considerable amount of heat. The sand should be cool and have very little green strength.

In the production of cores, the sand mixture is blown into a heated box with a conventional blower of the type used for making oil-sand cores. The corebox usually is heated to 400° F or higher. The binder acts quickly, and in 10 to 20 seconds the core will have cured sufficiently to permit it to be ejected from the box. At this point the core has a hard shell with uncured sand in the center; as it cools, however, the center continues to cure to maximum strength.

As indicated above, the cores produced are solid rather than hollow. The binder is not recommended for most shell cores made by the blow and drain or dump box processes, although cores of thick section can be made hollow to a degree by use of tapered plugs or lighteners contoured to the inner core surface. Such hollows are desirable for chunky cores where fast production is required because the binder is applicable primarily for a core thickness of 1 in. or less.

Ventilation Needed—During the curing of cores in a hot corebox, some formaldehyde vapor is liberated, and work stations require adequate ventilation. Core release from hot patterns is said to be remarkably good despite absence of any release agent in the sand. Coreboxes require no special treatment other than occasional silicone spray. New boxes should be broken in by treatment with a liberal quantity of carnauba wax at 350 to 400° F. Silicone emulsion spray suffices for subsequent treatment.

Collapsibility Good—Gas evolu-

IMPROVE LADLING OPERATIONS SIX WAYS WITH KAISER HELSPOT PLASTIC GRAPHITE-BASE LADLE LINING

The unusual combination of silky-smooth graphite and super-duty refractory ingredients results in Kaiser Helspot, one of today's finest ladle lining materials.

Kaiser Helspot Plastic makes metal-melting and pouring operations run more smoothly six different ways:

1 ABSENCE OF INCLUSIONS. Helspot minimizes metal contamination, insures cleaner metal, provides a way to avoid inclusion materials that affect casting quality, cause rejections.

2 LUBRICATED SURFACE. Helspot is non-wetting. Molten metal flows as freely over the Helspot surface as water flows off a duck's back, without penetrating or sticking.

3 EASY SLAG REMOVAL. Clean metal can only be poured from a clean ladle. Helspot successfully resists slag attack, reduces skull adhesion.

4 RESISTS THERMAL SHOCK. The Missouri Super-Duty Fire Clay base—plus blended graphite—gives Helspot unusually high spall resistance.

5 ECONOMY. Use of Helspot results in longer service life, lower refractory maintenance, more pours of perfect castings, fewer rejections ... more production at less cost.

6 HIGH FUSION. Helspot chemical components added to Super-Duty Fire Clays make ideal linings to combat temperatures encountered in metallurgical operations.

Ask your Kaiser Refractories Sales Engineer about the other advantages of using Helspot Plastic or Helspot Brick for wells, spouts, runners—wherever you want smoother flow of molten metal and minimum slag buildup.

Call or write Kaiser Refractories & Chemicals Division, Dept. FP-011, Kaiser Aluminum & Chemical Sales, Inc., at any of the offices listed below:

PITTSBURGH 22, PA. . . . 3 Gateway Center
MEXICO, MISSOURI . . . Mex-R-Co Building
OAKLAND 12, CALIF. . . . 300 Lakeside Drive

KAISER REFRACTORIES

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Circle 613 on Page 45

tion from poured molds presents no major problem, and collapsibility is reported to be good. A binder is available which is designed primarily for use where low-temperature collapse is desired, such as in the production of aluminum castings.

The resin may be used with any clean, dry sand. One manufacturer indicates that one-half of 1 per cent of its resin will develop 400 psi strength in zircon sand in 5 to 10 seconds on a 400° F pattern, and 2 per cent of resin will produce similar strength in lake sand in 10 to 20 seconds. In Juniata bank sand, 3 per cent resin will develop 300 psi on a 400° F pattern in 60 seconds.

Properly prepared sand stored at room temperature—about 75° F—has a useful bench life of 3 to 5 hours. Beyond this time the sand may be good but tests show that after 2 hours it gradually loses strength. Storage life can be lengthened but at the expense of curing speed.

The binder is relatively inexpensive, the resin being priced at about 19 to 25 cents a pound, depending on quantity ordered, and the catalyst at 10 cents a pound.

REFERENCES

1. *Materials Handbook*, eighth edition, Page 350, McGraw-Hill Book Co., New York.
2. "Furfuryl Alcohol," Bulletin 205, the Quaker Oats Co. Chemicals Dept., Chicago.

Western New York Chapter, AFS, Installs New Officers

Western New York Chapter of the American Foundrymen's Society installed new officers and directors at its May 5 meeting. New chairman is Ed J. O'Connell, American-Standard Plumbing & Heating Div., and vice chairman is Ronald E. Turner, Queen City Sand & Supply Co. Leonard Greenfield, Samuel Greenfield Co., has been appointed treasurer, and Bruce Artz Jr., Pangborn Corp., is secretary.

Directors to serve for three years each are T. H. Booth, Frontier Bronze Corp.; Julian J. Hubble, Chevrolet-Tonawanda Foundry, General Motors Corp.; and Daniel R. Pohlman, Pohlman Foundry Co.

MHI Announces Plans for Its 1962 Regional Trade Shows

The Material Handling Institute Inc. has announced the show dates and exhibit halls for its 1962 program of regional trade shows to feature industrial material handling and packaging products. The shows will be held as follows: Pacific Coast Show, March 6-8, Pan-Pacific Auditorium, Los Angeles; Great Lakes Show, June 19-21, Cobo Hall, Detroit; and Southwestern States Show, Nov. 6-8, State Fair Park, Dallas.

The American Material Handling Society Inc. and the Material Handling Equipment Distributors Association also support the shows.

Goal of the program is to expose potential exhibitors to maximum customer audiences at the lowest possible display expense, with minimum travel costs to buyers of industrial material handling and protective packaging equipment.

Complete information on the regional shows for 1962 can be obtained from Hanson & Shea Inc., 1 Gateway Center, Pittsburgh 22, Pa.

PROVIDES LONGER LIFE–NO HOT SPOTS

Acme melting pots and ingot molds assure even heat distribution without hot spots . . . they improve non-ferrous casting quality and put a damper on rejects. Cast of a specially developed iron alloy, Acme pots and molds provide great strength and unusual resistance to high temperatures, too. As a result they consistently reduce down time and substantially cut replacement costs.

Stocked in forty sizes and a complete range of styles, you can standardize on Acme melting pots and molds and be confident of immediate shipment at all times! Take advantage of all these benefits . . . proven over a period of more than 30 years.

★ **FORTY SIZES IN STOCK**

Quick delivery anywhere in the United States eliminates your "stand-by" non-ferrous pot and mold inventory. Write for bulletin listing all sizes and styles.

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SALVAGE YOUR VALUABLE MOLDING SAND with a SIMPLICITY RING-TYPE CRUSHER SCREEN

188

You profit two ways with Simplicity's Ring-Type Crusher Screens

- Your used core and molding sand is crushed and screened for re-use in one operation, saving the cost of new sand.
- Transportation and dumping costs of used sand are eliminated.

This unit combines the Simplicity heavy-duty vibrating screen with free-turning cast rings mounted over crushing plates. One to three sets of rings can be supplied, depending upon the maximum lump size to be crushed.

Simplicity ring-type crusher screens are paying their way in foundries producing magnesium, steel, malleable and grey iron castings throughout the United States.

Available in many models and sizes. For complete information write today for the name of our sales engineer in your area; and turn your waste into profits.

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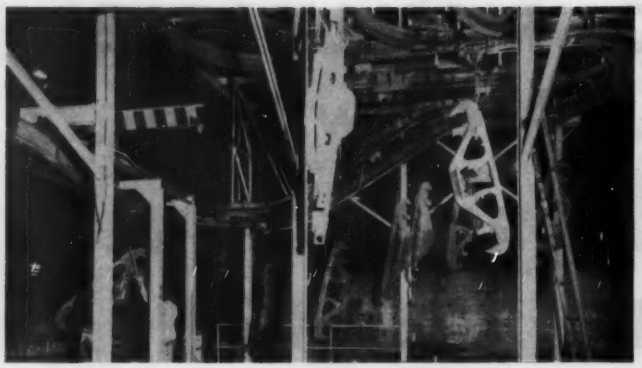
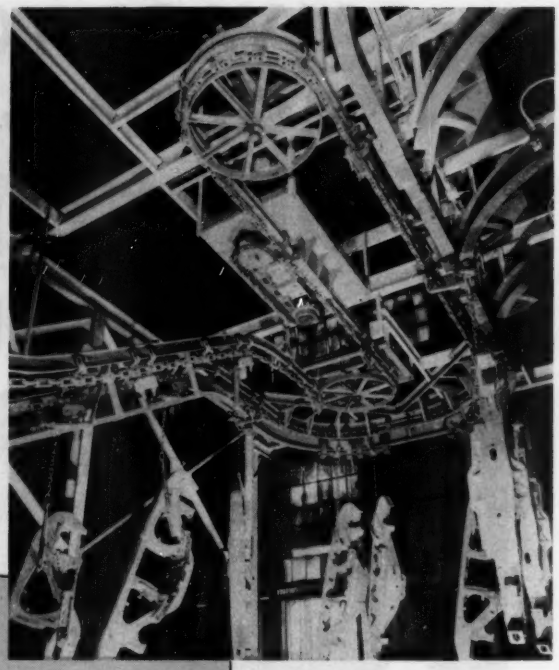
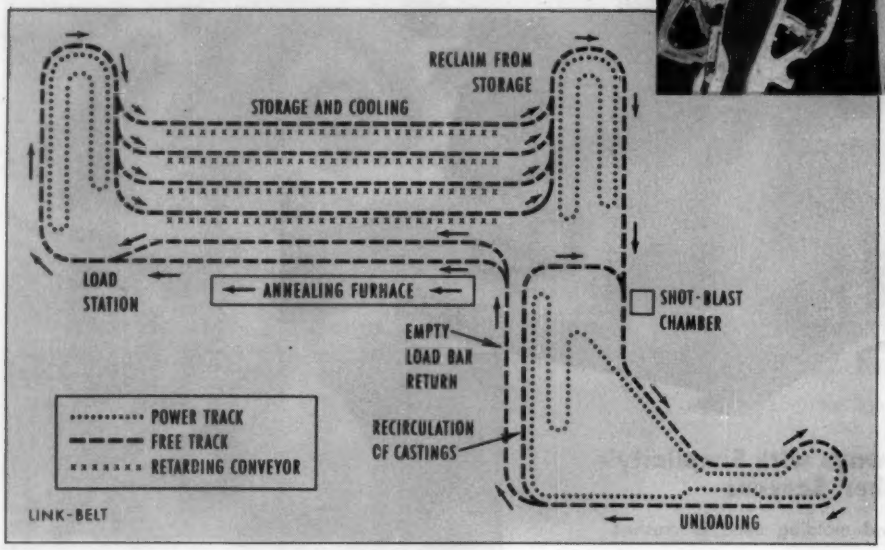
Circle 615 on Page 45



Castings are removed from annealing furnace cars by jib crane and air hoist (left) and placed on conveyor system

Castings are elevated, switched to any of four storage lines, and directed to the finishing area by gravity





This system consists of a circuitous free track, which connects all stations in the processing operations, and three powered conveyors that move castings along the track from annealing to storage, from storage to shot-blast area, and from shot-blast area to the unloading area

CONVEYOR SYSTEM SPEEDS HANDLING OF

● SCULLIN Steel Co., St. Louis, formerly handled cast bolsters, side frames, and yokes from shakeout through processing on heavy steel skids. These skids were transported between work stations by chain slings and overhead crane. As production costs increased, a method of straightline production was sought to eliminate multiple handling.

The principal production requirements in this phase of the finishing operations were:

1. Adequate cooling time and storage space for 125 tons of castings.

2. Selective removal from storage to meet production schedules, without interrupting the sequence of other operations.

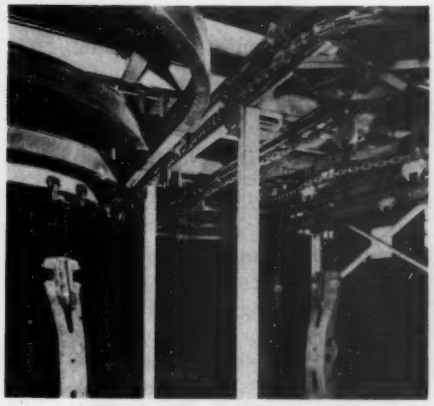
3. Transportation of castings through shot-blast cleaning and inspection.

4. Flexibility to permit recirculation of inspected castings for additional cleaning or reprocessing.

5. Accommodation of special rush orders that demand quick shipment, without disrupting normal operations and casting storage capacity.

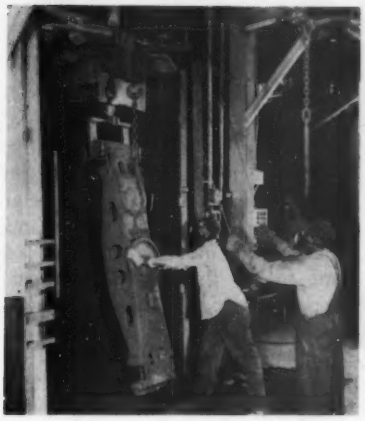
A Link-Belt power-and-free conveyor system met all five requirements.

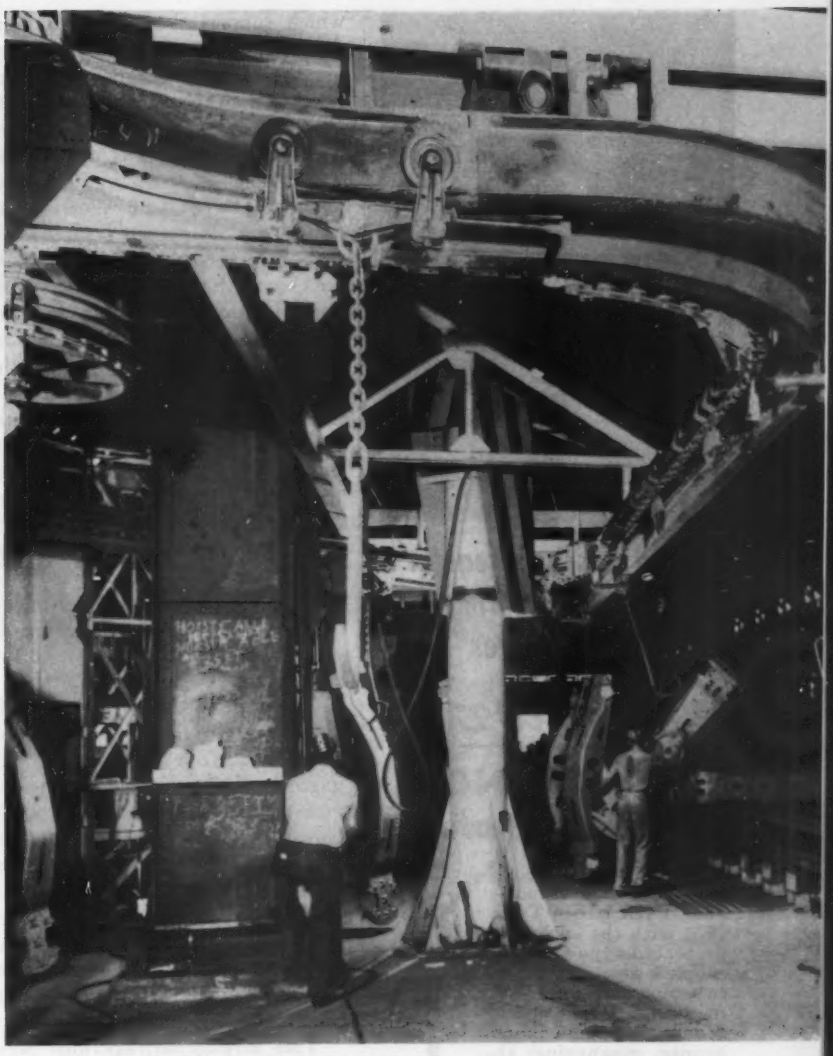
Connects All Stations—The system installed for Scullin consists of



After cooling, castings are selected from any storage line and moved by a power conveyor to the shot-blast

At shot-blast unit, castings are removed from load bar hook and placed on work hook in the chamber





Cleaned castings are unloaded from the conveyor to work stands for further chipping of gates and sprues and for final inspection

LARGE CASTINGS

a circuitous free track that connects all stations in the processing operations, and three powered conveyors that move the castings along the free track from annealing to storage, from storage to shot-blast area, and from shot-blast to unloading area and, if necessary, back to shot-blast chamber. The free track divides into four parallel cooling and storage lines, with switching arrangements at each end and with retarding conveyors to control the speed of castings.

Power-and-free conveyors are a combination of powered trolley conveyor and unpowered monorail-type free conveyor. The powered conveyor engages trolleys and carrier on the free-rolling monorail and moves them to a point where they can roll by gravity or be manually pushed to work stations or storage areas. Power-and-free conveyors provide—in one integrated system—all the advantages of both powered trolley conveyors and free-rolling monorails, coupled with any desired amount of automatic control.

The system now in operation at Scullin Steel utilizes the side-by-side type of conveyor design, whereby two sets of trolley tracks are arranged alongside each other. I-beam sections are used for the track system, and both tracks are suspended from common supports which handle castings with a maximum weight of 930 lb and provide storage for 300 castings.

The castings consist of bolsters, side frames, and yokes. Bolsters are the interlocking cross members

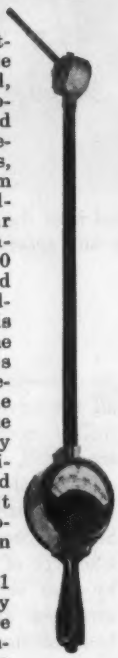
Good Castings require accurate pouring temperatures

Alnor

PYRO LANCE gives instant readings

The self-contained, portable, Pyro Lance Type 2981 with the enclosed, protected type thermocouple is especially suited to temperature measurements of molten brass, bronze, copper, aluminum bronze, magnesium alloys, and any similar metals where temperatures are not over 2300 deg. F. The protected thermocouple, with adjustable angle head, is mounted in the tip of the lance and thus takes temperature readings below the surface of the molten metal, with a true reading unaffected by dross or surface conditions. The enclosed head is protected against flame, fumes, and corrosion, assuring long life in severe service.

Pyro Lance Type 2981 has reading dial in sturdy aluminum handle. Price $97.00. For complete information on various models and prices write for Bulletin 1724.



Type 2981

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Circle 616 on Page 45

which support the weight of gondola, box, and tank cars. Side frames are the castings designed to accept bearing journals into which railroad car axles and wheel assemblies are fitted. The yoke is part of the end coupler or coupling assembly.

How The System Works—The sequence of operations begins when castings are received from the core knockout. After the gates and sprues and other excess metal have been removed, castings are placed on furnace cars that move through the annealing furnace. The annealing cycle varies with the size and weight of the castings. Castings loaded onto the conveyor system are hot but do not exceed 350° F. After preliminary cooling they are removed from annealing cars by means of an air hoist mounted on a jib crane and placed on the four-wheel trolley assembly of the Link-Belt power-and-free conveyor.

Castings are pushed manually along the free track to a position where the trolley assembly is engaged by the pusher bar of the powered trolley conveyor. This is an inclined pusher conveyor that elevates the castings to the highest point in the system—about 15 ft above floor level. They are sorted by type and directed by means of switches into any one of four storage lines that will accommodate about 250 tons of castings.

This arrangement permits shot-blast operations on any type of casting, regardless of the order in which they are loaded to the system from the annealing furnace.

Retarding Chain Conveyor—In view of the tremendous weights that accumulate on the conveyor, heavy castings entering the storage area have to be controlled to prevent their building up speed on the gravity run. For this purpose each storage conveyor is equipped with a retarding chain conveyor, operating on 132-ft centers, which controls the speed and limits casting travel on the free run to 10 fpm.

This chain, equipped with retarding dogs, allows for gentle accumulation of castings at the automatic stops at the end of each storage line. The retarding conveyor travels continuously at a uniform speed.

After cooling, the castings are selected for transfer to the powered conveyor line by the shot-blast operator who manually controls the switching operation at the cleaning unit.

The castings on the powered line of the power-and-free conveyor are controlled by limit switches that positively station each casting at the receiving chamber of the shot-blast unit.

Shot-Blast Cleaning—At the vertical shot-blast cleaning chamber, individual castings are removed from the conveyor by an air hoist mounted on a tilting boom crane and transferred to the work hook within the shot-blast cabinet. This three-station machine indexes the casting 120 degrees for the initial blasting, rotates 360 degrees during the cleaning process, and then indexes again 120 degrees for visual inspection. At this point, if it is necessary, further cleanup can be done at a manually operated shot-blast station, and the casting is again indexed 120 degrees for removal from the chamber.

After shot-cleaning, the casting is returned to the trolley conveyor load bar and manually pushed to make contact with the powered line. It is conveyed to the unloading area where it is removed from the load bar and placed on special heavy rail stands. These stands and castings are moved by overhead crane to the finishing department, where any remaining operations are completed.

Empty load bars are returned on the free track to either of two lines that parallel the annealing oven. A limit switch automatically controls trolley entry to these storage lines so that when one line is filled, the trolleys are automatically diverted to the other storage line. In storage, the trolleys move by gravity to the load point where the castings are removed from the annealing oven.

Recirculation Conveyor—Flexibility of this installation is greatly enhanced by a recirculating conveyor which is used for improperly cleaned castings and "blowbacks."

Rejected work can thus be returned automatically from inspection stations to shot-blast chamber and rework stations without going through cooling and storage. The powered conveyor also permits easy return of empty carriers to storage ahead of various load stations.

On occasion the castings selected

nothing tricky about it!

METAL BLAST simply has a new and much more economical process for making steel shot and grit! This is an entirely new and different manufacturing process and we have applied for a patent on it.

We *don't* use the conventional equipment and processes that others use. We *do* come up with a product meeting exacting laboratory tests and *guaranteed* to equal the performance of any steel abrasive on the market. Our savings in production costs are passed along to you and other potential users in the form of lower prices.

That's our story — and if $165 per ton sounds good to you, why not at least investigate? A letter, wire or phone call (collect) puts you on the road to savings!

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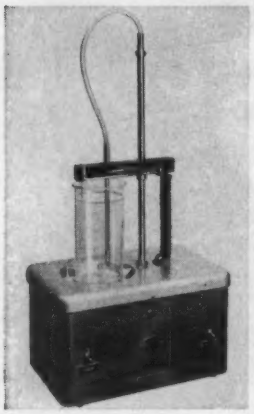
Circle 617 on Page 45

POUR CLEANER-FINER CASTINGS

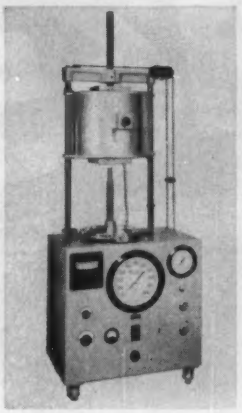
CONTROL

√ CLAY CONTENT
√ HIGH TEMPERATURE PROPERTIES
√ MOISTURE
√ METAL FLUIDITY
√ HARDNESS

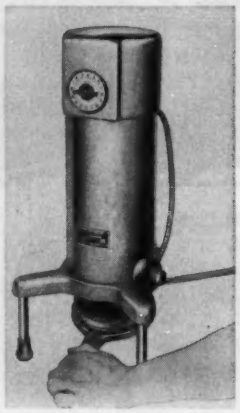
...with DIETERT-DETROIT CONTROLS



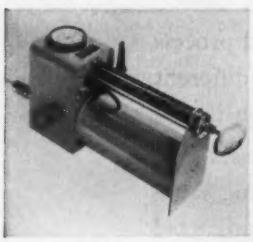
AUTOCLAY . . . No. 513
Saves operator's time in running A.F.S. clay substance test. Better castings and easier molding result from sands with controlled clay content.
To obtain better casting finish, improve sand grain distribution, control fineness.



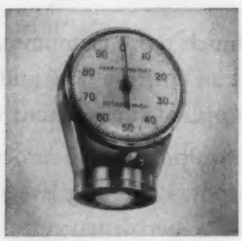
THERMOLAB . . . No. 785
For clean castings, free of defects. Test and control the high temperature properties of your molding materials with the Dietert-Detroit Thermolab. Reduce or eliminate scabs, cuts, etc.



MOISTURE TELLER . . . No. 276
Control moisture content in your molding sands and you will control the greatest variable causing defects in any foundry. The No. 276 takes but a few minutes to check moisture content.



RAGONE . . . No. 4210
Measure fluidity of ferrous and nonferrous metals in seconds. Take the guess-work out of pouring requirements—know when your metal will flow properly to fill the mold.



MOLD HARDNESS TESTER . . . No. 473
Molds too soft? Rough surface can result. Molds rammed too hard? You may get rat-tailed or buckled castings. Be sure your molds are properly rammed, use the No. 473 Hardness Tester.

MOTOR DRIVE . . . No. 401
Eliminate the human variable of hand loading . . . equip your hand-operated sand strength machine with a No. 401 Motor Drive.

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Gentlemen: Rush me data on the following:

☐ Autoclay No. 513
☐ Thermolab No. 785
☐ Moisture Teller No. 276
☐ Ragone No. 4210
☐ Mold Hardness Tester No. 473
☐ Motor Drive No. 401

Name_____
Company_____
Address_____
City_____ State_____

for special attention can be carried by overhead crane and introduced into the cleaning cycle through the recirculating conveyor. Should it become desirable during certain phases of production, one of the storage lines ordinarily used for cooling castings can also be converted to send castings from the load point directly to the shot-blast unit.

By controlling precisely the speed of travel with escapement mechanisms, electric interlocks, limit switches, and automatic backstop mechanisms, the system offers the maximum of safety for operating personnel and straightline minimum handling of the product.

European Foundry Apprentice Competition Prizes Awarded

R. Flahaut, a French representative to the European Foundry Apprentice Competition, won first place in a competition for apprentices under 20 to make the best sound engineering casting—a component for steam industrial plant—and to take a written examination in the theory for foundry work. A British competitor, C. F. Corbett, was second, and T. J. Vincent, another Briton, came third.

Three countries entered full teams of three competitors each. Of these, France was first, Great Britain second, and Germany third.

Book Review

ASTM Standards on Light Metals and Alloys, **hard cover, 368 pages, 6 x 9 in., published by the American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa. Price $4.50.**

Book contains 57 standards, of which 15 are revised or have had their status changed since the previous edition and 3 are new standards, including one for aluminum alloy pipe which is used for gas and oil transmission. The publication also has a new specification for aluminum coated steel wire for electrical transmission and a new method of testing for electrical conductivity with eddy current procedures.

Materials covered are aluminum and aluminum alloy and magnesium and magnesium alloy ingots, castings, tubes, sheet, forgings, bars, rods, and shapes.

Circle 618 on Page 45

Circle 632 on Page 45→

ALUmelt

Crucibles for melting and holding aluminum

***ALUmelt crucibles offer:**

Faster melting time

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Least contamination

Up to 35% savings on initial investment

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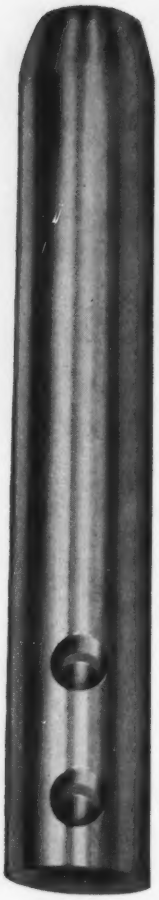
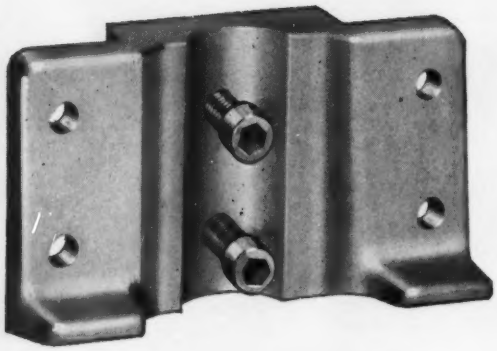


ADAMS 1" ROUND PIN

Side Mounting—Reversible
Countersunk Both Sides
Hardened—Ground
Hard Chrome Plated

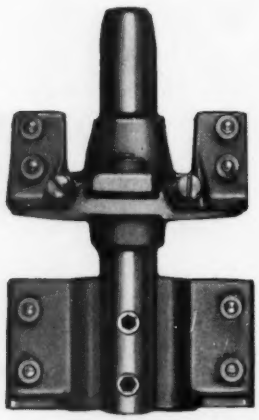


ADAMS 1" ROUND PIN BASE
(Cast Aluminum)

For Side Mounted Reversible Pins
Pins Mounted with Allen
Hollow Head Set Screws

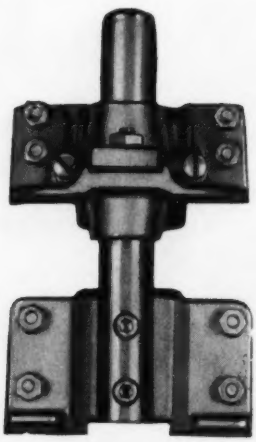
ADAMS MATCH PLATE EAR

Extra Long for
1" diameter Pins
(Side Mounted)



ADAMS 1" ROUND PIN AND EAR
(For Cherry Flasks)

Side Mounting Permits Use of
Extra Long Match Plate Ear As-
suring Expert Deep Pattern Draw



ADAMS 1" ROUND PIN AND EAR
(For Aluminum Flasks)

Side Mounting Assures Rigidity
of Pin. Adds Extra Life Because
of Simple Reversible Feature

1883—ADAMS QUALITY AND PRECISION—1960

Adams Quality and Precision remains constant through rigid specifications governing the manufacture of all New Flask Equipment or Flask Trimmings to be used for Part Replacement. Write us today. Your equipment problems can be solved by Adams.

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ESTABLISHED 1883

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700 FOSTER STREET, DUBUQUE, IOWA, U.S.A.

Man to Man

By RALPH L. LEE, *President*

Lee Hobby Foundry
Birmingham, Mich.

"In all these operations, a level of quality was maintained which seemed to be at least 10 per cent higher than enough to get by"

A Visit to a Good Foundry

● AT THE MENTION of Traverse City, Mich., most people automatically think of conventions, fishing, vacations, or the capital city of the cherry growing kingdom. So did I until last week.

With my return plane from a speaking engagement in Traverse City canceled, and with seven hours to use as I saw fit before the next plane, I turned to the yellow pages of a very thin telephone book with the faint hope of finding a foundry to visit. I was surprised to find one listed, which I guessed would be some peewee affair tucked away among the cherry trees.

But the Traverse City Iron Works turned out to be anything but that. The girl on the switchboard, after a quick check, gave me a friendly invitation. The taxi driver, as he pocketed my fare, said, "You'll like those people in there." I told my host what the taxi man had said and soon found that he was right.

Before the trip through the plant, my host briefed me on the company's products and its history, which went clear back to 1871. Started during the lumber boom as a supplier of repair parts for logging apparatus and saw mills, including steam engines and boilers, the company has adjusted to changing times and hung on through thick and thin. Crowded for room, it completes successfully with much larger concerns.

The firm now manufactures and markets a full line of equipment for water systems, including fireplugs, valves of every description, and all sorts of fittings—in fact, hundreds of items. You should see their pattern storage!

With such a hodgepodge of products, produced in lots ranging from singles on up to he-man quantities, I fully expected to find the boys in the shop and foundry stumbling all over themselves in a conglomeration of equipment, castings, materials, and parts in process. But I did not.

Instead, I found unmistakable signs of order every place I looked, plus excellent housekeeping. I don't want to go overboard on the significance of good housekeeping, but there's no longer any doubt in my mind that it is an infallible index to the degree of solvency, virility, and life expectancy of most businesses—particularly foundries.

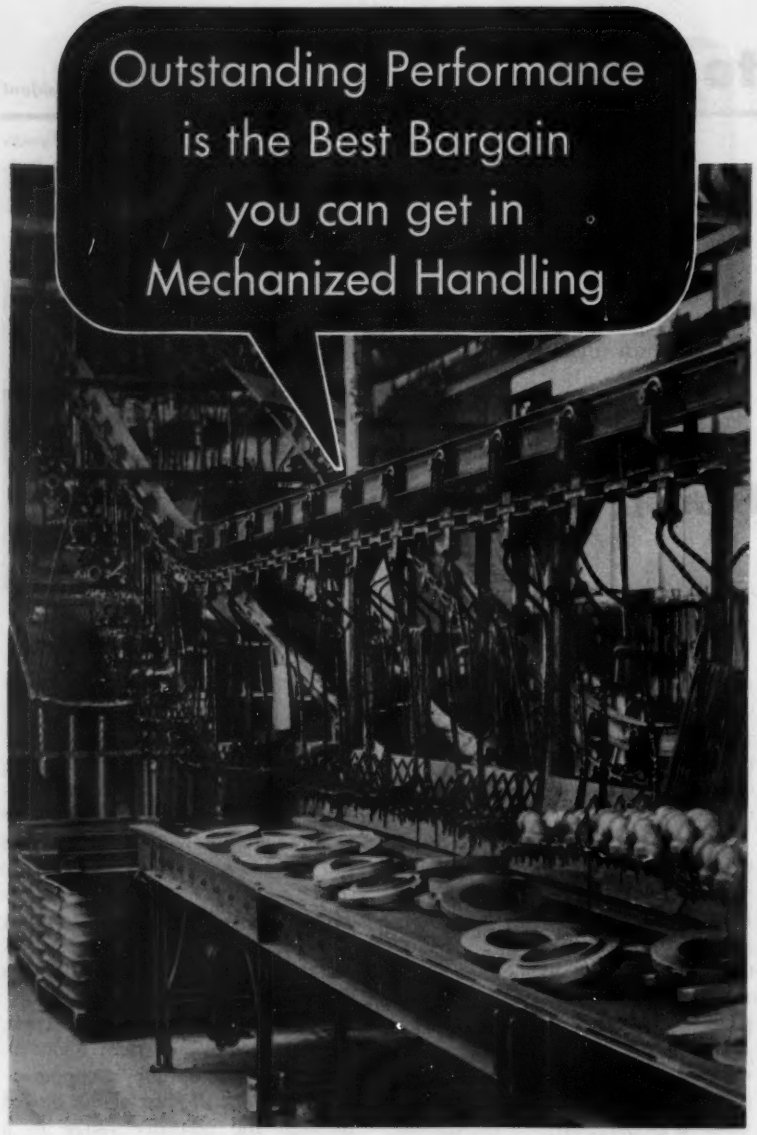
Although only an amateur, I certainly did like what I saw in the coreroom. The cores were exceptionally hard and fine-grained for their size—no crumbly corners. I wondered about shakeout, but later discovered that it was no problem. Precision fits between core and print also were the rule. The company uses the same sand mix for a wide range of core sizes.

This foundry has got onto the trick of casting gray iron around bronze inserts—a trick I discovered was not learned overnight, not by a long shot. A delicate balance is involved because of the two melting points. But probably the most interesting thing to me, with my Lee Hobby Foundry background, was the dollars-and-cents wisdom the company seemed to employ in the degree of mechanization, rigging, or labor-saving devices applied in relation to the quantities of castings being produced.

Single orders went to the bench, of course, with no bones about it. Then, in appropriate (economics-wise) degrees, the production moved through the quantity range to a fully automatic shell core machine, of the plant's design, for making 8-ft hollow shell cores in impressive quantities. Through all of these operations, a standard of quality seemed to be maintained which was at least 10 per cent higher than might have been got by with.

Molding operations seemed to be guided by the same philosophy—safe margins of quality a must and waste elimination and penny saving the order of the day, all managed in spite of the wide range in quantity.

Sandslinger, jolt-squeeze, handbench, and floor molding were used in appropriate applications. Sand conditioning bowed to the same law. It was done by methods ranging from an overhead system to portable mullers and hand-shovel cut heaps,



• Many plant operating people responsible for specifying conveying systems today are demanding equipment that is right *for them*—that will fully meet *their* individual requirements—that is built to operate under severe service. They are looking beyond the price—to design and quality.

Mathews Engineers are giving these people a complete conveyer service — from the first proposal through installation—and equipment that is delivering outstanding performance in the metalworking industries.

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Port Hope, Ontario, Canada

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MATHEWS

with a complete sand lab hounding the full array.

Accurately cast bronze valve seats, with no machining, were swaged into place, then machined—and with little scrap after high-pressure hydraulic testing. As-cast bronze valve stems were chucked and threaded. When I saw this operation, I said, "Hey, gimme one of those!" I found that they cleaned up with amazingly small allowance for finish.

When I complimented my host, he replied, "We have one heck of a way to go yet."

"Braggart," I murmured.

We haven't time to talk about the cupola and the charging and melting practice, but, even as an amateur, I recognized good iron when I saw it. Incidentally, I always insist on seeing the purchased scrap heap. It's another of those telltale indicators, I always say.

I had a good time, especially when I met the president. At first he seemed to be tongue-tied, but he unlaxed as our friendship developed in short order and blossomed into buddyship during lunch. No greater truth ever was spoken, it seems to me, than the statement, "Most organizations are the lengthened shadows of the men who lead them."

Foundry Is a Tradition

William A. Royce Sr., now 71, told me that his dad had spent most of his business life in the organization, just as he has done, and that his son, William A. Royce Jr., 42, now really runs the place. He added that he wouldn't be a bit surprised if his grandson also headed in the direction of the family tradition in the foundry.

On the way to the airport I learned from my driver and guide that layoffs have been scarcer than hen's teeth in the company's history, that this fellow liked his work very much, and that he felt almost like a son to the president and like a brother to the president's son. The splendid work tempo I noticed during my visit seemed to indicate that this splendid man-to-man relationship filtered through the entire organization. I wouldn't be surprised to discover that it constitutes the secret formula which has kept the Traverse City Iron Works marching on through thick and thin all these years, headed for still greater things to come.

Gray Iron Foundry Milestones — No. 1

ARCHEOLOGICAL STUDIES have unearthed findings, dating back several thousand years B.C., which relate to the melting and casting of iron ores. Impure bog ores were reduced to spongy masses and cast into molds hewn of stone to form crude agricultural implements and weapons. To help increase the fluidity of the molten metal, animal and sometimes human bones were added to the melt.

This was the humble beginning of a craft that has developed, down through the centuries, into the highly specialized Gray Iron Industry of today. From machinery to bathtubs, from steel mill rolls to motor housings, gray iron castings play a vital role in the nation's industrial growth.

As a supplier of quality foundry coke and pig iron, Pittsburgh Coke & Chemical Company is proud to contribute to the continuing growth of the great Gray Iron Foundry Industry.

Reproductions of the "Primitive Iron Makers," suitable for framing, may be obtained without charge by writing to the Coke & Iron Division, Pittsburgh Coke & Chemical Company, Grant Building, Pittsburgh 19, Pennsylvania.

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Neville Pig Iron and Neville Coke for the Foundry Trade

Circle 620 on Page 45

Around the Country

NEWS REPORTS FROM

Philadelphia . . . Chicago . . . Pittsburgh

Pittsburgh— With district steelmaking operations averaging less than 50 per cent of capacity and many foundries closed for vacations, business is at a low ebb. Foundry sales have paralleled the trend in steelmaking, and there are no indications of an upturn. Most foundries are operating at 40 to 50 per cent of capacity—five days a week, but on reduced schedules. Backlogs are negligible.

Because of growing pessimism about the economic outlook, capital expenditures are under close scrutiny. Heavy machinery manufacturers aren't making many sales, so they're buying few castings. Foundrymen are receiving inquiries, but it's apparent that users aren't serious about ordering. They're just checking prices to find out what they would have to pay if they wanted to buy.

Demand from railroad car builders has been disappointing. In the East, the reason may be that some of the carriers are waiting to see whether their merger plans will be approved. Elsewhere, reduced carloadings and falling revenues have caused the railroads to curtail their repair and replacement programs.

Foundries that supply the car builders had good shipments through July, but orders have tapered off sharply. Firms that had 90 day backlogs through most of the first half report that they can now see only 30 days ahead. The outlook for the rest of the year is clouded. Some observers expect no pickup in demand from eastern railroads until the first or second quarters of next year.

First-half shipments of rolling mill rolls compared favorably with thost of last year's first half. Current demand is off, reflecting the low level of steel industry operations. Mill inventories are thought to be low, so there's a good chance that demand will pick up before the fourth quarter. The turn will come when automakers start ordering heavily for their 1961 models and other steel users come into the market for flat rolled products.

Chicago— Shutdown operations at International Harvester Co.'s McCormick Works here are proceeding ahead of the three-year timetable. The facilities now are expected to be fully closed by the end of 1961 instead of the spring of 1962.

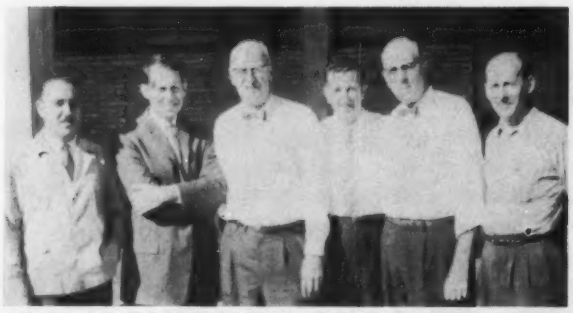
Mark V. Keeler, vice president of the company's farm equipment group, announced plans for the shutdown on April 17, 1959. He said trends in agriculture and the farm equipment market as well as the age and conditions of the buildings prompted the decision.

The malleable foundry operations already have been transferred to Harvester's Waukesha, Wis., works. About 50 per cent of the product lines once fabricated at the McCormick works have been transferred to facilities in East Moline and Canton, Ill., and in Memphis. Transfer of the remaining 50 per cent to the three cities will be effected probably by next summer.

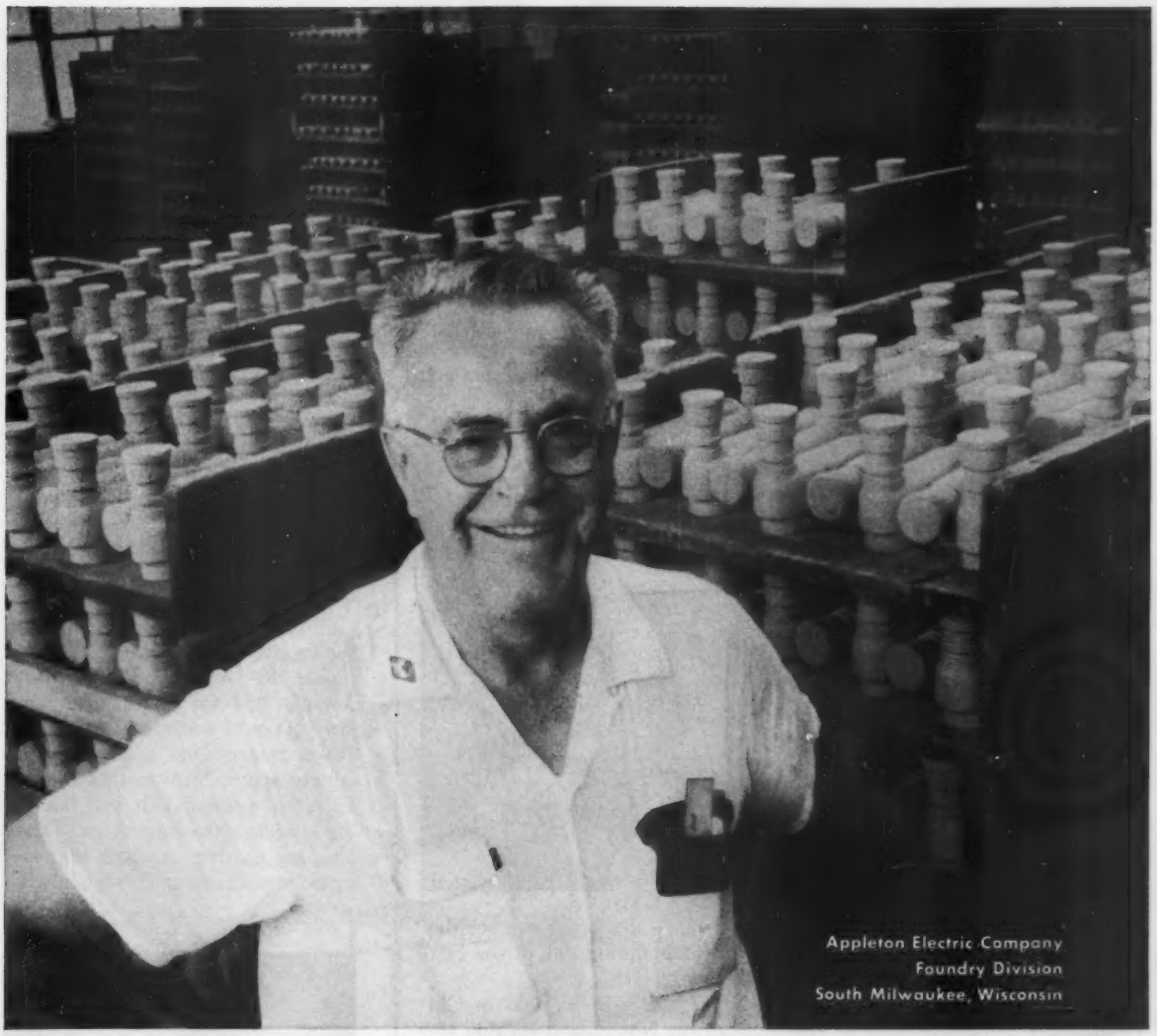
Nodular iron production and malleable annealing operations will continue at the McCormick works until the fall of 1961.

* * *

A rule requiring cast iron pipe for house sewer laterals in the Milwaukee area was held to be unconstitutional and monopolistic by the



AMERICANS IN ARGENTINA: Since 1957, many American foundrymen have worked at Acinfer iron, steel, and aluminum foundries, Villa Constitucion, Argentina, to teach modern foundry practices to Argentine personnel. Left view, from left to right: F. Paniagua, Argentina; Cecil King, Detroit; Jack Horsfield, Indianapolis; Gordon Dougal, Detroit; Tom Gross, Indianapolis; and Sheldon Pattee, Chicago. Right, back row (from left) are Hans Klein, Fairbanks, Alaska; Don Holman, Muskegon, Mich.; Art Belanger, Chicago; Frank Bates, Buffalo; Bill Lantry, Chicago; Byrne Pattee, Chicago; Joe Zeglen, Bettendorf, Iowa, and Earl Nelson, Chicago. Front row, from left, are Al Black, Chicago; Tom Bair, Canastota, N. Y.; Dom de John, Rockford, Ill.; John Kruse, Albion, Mich., and Bill Jones, Chicago



"The pace...terrific...50,000,000 cores a year...we do it with one core oil...Cities Service #58"

The foundry division of Appleton Electric Company is noted for being one of the most modern, highly mechanized, and fastest paced in the business. Often cores still warm from being made in the morning are used that same afternoon. There just isn't time to store them. There isn't time for interruptions or down time either.

To accomplish this, the foundry depends on the most modern equipment, highly skilled men and women, and Cities Service Delco #58 Core Oil. With this *one* oil, they get consistently high-quality core production. Delco #58 remains the same from batch to batch, month in and month out. It's this kind of dependability that keeps those 50,000,000 cores on the line, ready to be used when they're needed. And in the foundry of Appleton Electric they're always needed "right away."

Every year, more and more manufacturers are taking advantage of the dependability and high-quality of Cities Service Delco Core Oils. If you'd like to know more about them, and how they can help speed up and improve your operations, why not talk with your Cities Service Lubrication Engineer? He is *trained* to help you find the core oil to meet your specific problems. Or if you prefer, write: Cities Service Oil Company, 20 N. Wacker Drive, Chicago 6, Illinois.

CITIES SERVICE

QUALITY PETROLEUM PRODUCTS

Circle 621 on Page 45

Wisconsin state supreme court June 28.

The unanimous decision upheld a ruling made a year ago by Circuit Judge Ronald A. Drechsler. Five manufacturers of bituminous fiber pipe challenged the validity of the rule adopted in 1958 by the city and metropolitan sewerage commissions. Judge Drechsler ruled that the commissions had exceeded their powers. The high court agreed.

Testimony at the lower court trial indicated that at least $109.50 could be saved by using bituminous rather than cast iron pipe in laying a house lateral. In his decision, however, Judge Drechsler said that the commissions' rule would require that cast iron pipe be used in corrosive soils and fill materials.

"The evidence has clearly established that there is enough of such unfavorable soil in the district to be a substantial element to be provided for," he said.

The court said that if the rule had contained a method for granting exceptions to the use of cast iron pipe, the rule would have been held valid.

ICI Holds Regional Casting Design Clinics

Investment Casting Institute, Chicago, sponsored an Investment Casting Design Clinic in Newark, N. J., May 10, and is planning another clinic to be held at the Hotel North Park, Chicago, Nov. 1.

At the May session, papers and discussions were presented on "Design Criteria for Investment Castings," C. H. Porter, Casting Engineers Inc., Chicago; "An Analysis of Investment Casting Specifications," K. W. Thompson, K. W. Thompson Tool Co., Long Island, N. Y.; "Applications for Investment Casting," W. A. Dubovick, Engineered Precision Casting Co., Matawan, N. J.

In a discussion of alloys used for investment casting, E. G. Broad, Hitchiner Mfg. Co., Milford, N. J., covered nonferrous alloys; J. W. Putnam, Engineered Precision Casting Co., discussed ferrous alloys; and R. J. Metzler, WaiMet Alloys Co., Detroit, discussed high-temperature alloys. Illustration above shows some of those in attendance at the May clinic examining one of the castings displays.

The clinic to be held in Chicago on Nov. 1 will include two workshop sessions. The committee, headed by J. H. Cadieux, Casting Engineers Inc., has selected the following topics for each workshop: Designing for Lowest Cost, Applications for Investment Casting, How to Recognize Investment Casting Applications, The Economics of Tooling, and Recent Developments in Alloys for Investment Casting.

Following the workshop sessions, a room will be provided so that those attending the clinic can discuss specific investment casting problems important to their companies. Participants are invited to bring blueprints or other material to the problems sessions.

More information about the clinic can be obtained by writing to the ICI, 27 East Monroe, Chicago 3.

Philadelphia— Foundry operators anticipate a slight production upturn in August. Operations will still be affected adversely by vacations and hot weather, but these influences should be less pronounced than in July. No substantial gain in business, however, is considered probable until after Labor Day week end.

Gray iron and steel foundry operations are estimated at around 60 per cent of normal capacity. Schedules are three to four days a week, with most gray iron jobbers offering deliveries within two weeks. Steel foundries are promising deliveries in approximately four to five weeks.

Among the more active lines at the moment in gray iron are vacuum pumps for the chemical industry, sewage disposal equipment, and some types of conveying machinery. Power transmission needs are moderately active. Steel casting producers report a pickup in missile launching equipment requirements. They also are sharing in some improvement in mining machinery specifi-

LEADER HONORED: On June 16, the Brass & Bronze Ingot Institute presented a testimonial scroll to Dr. Guilliam H. Clamer of Philadelphia, left, on his 85th birthday, honoring him for 65 years of service to the nonferrous metals industry. Right is Benjamin Harris, president, Benjamin Harris & Co., Chicago Heights, Ill., who represented the Institute

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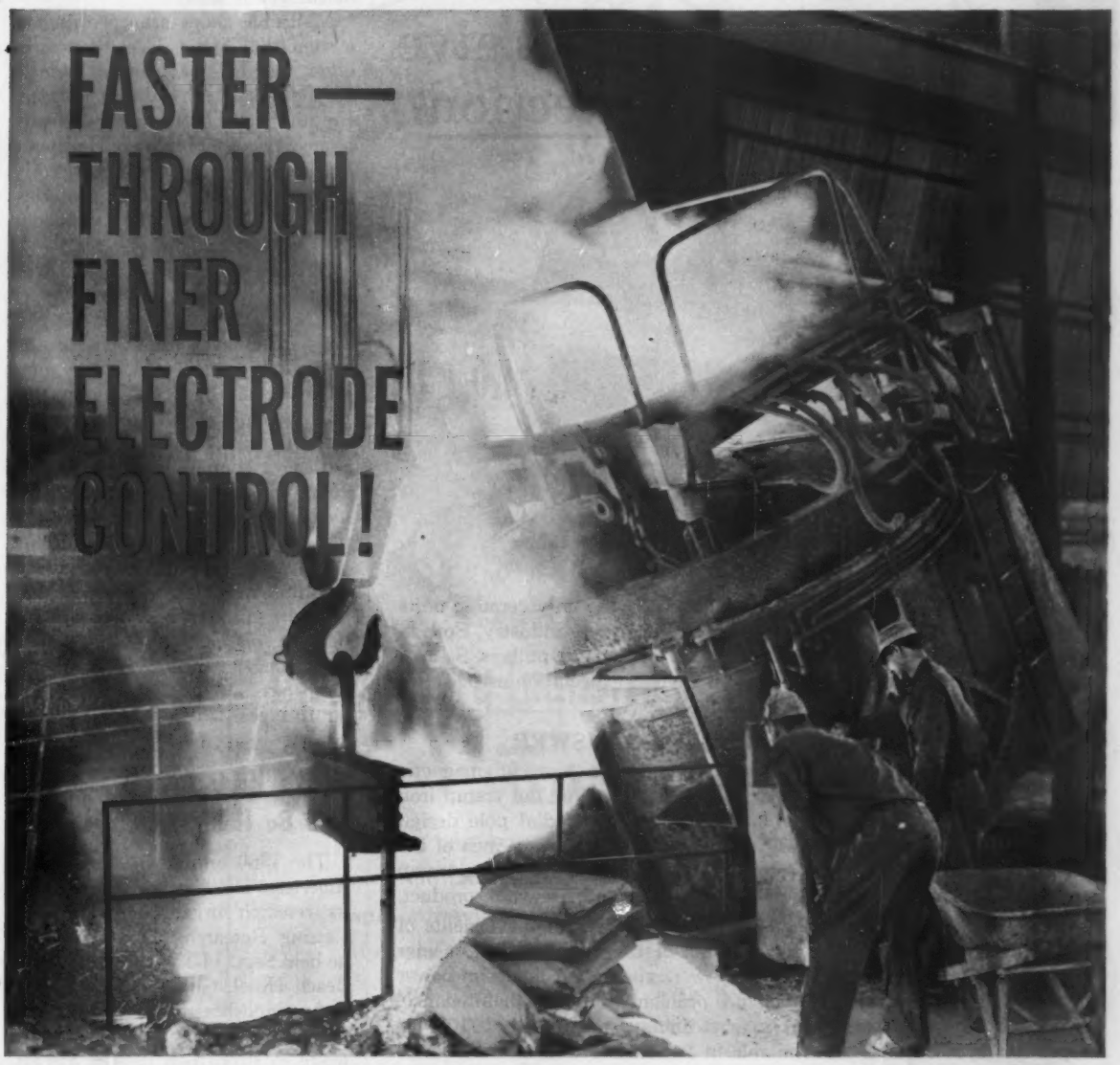

Hydro-Arc electric furnaces, from Whiting, give you full-time arc efficiency, faster heats, more wattage turned into melt, lower electrode consumption, virtually no electrode breakage. Arc adjustment is instantaneous. Mechanical lag? Almost totally eliminated by non-stop, non-reversing electrode motors plus vital air counterbalance. Here's Whiting's new concept in low-cost electric melting—new, yet fully proven for your benefit in steel mill after steel mill. Look into Hydro-Arc now!

Get Details in Hydro-Arc Catalog No. FY-168, or ask a Whiting furnace engineer to call. No obligation. *Whiting Corporation, 15607 Lathrop Avenue, Harvey, Illinois.*

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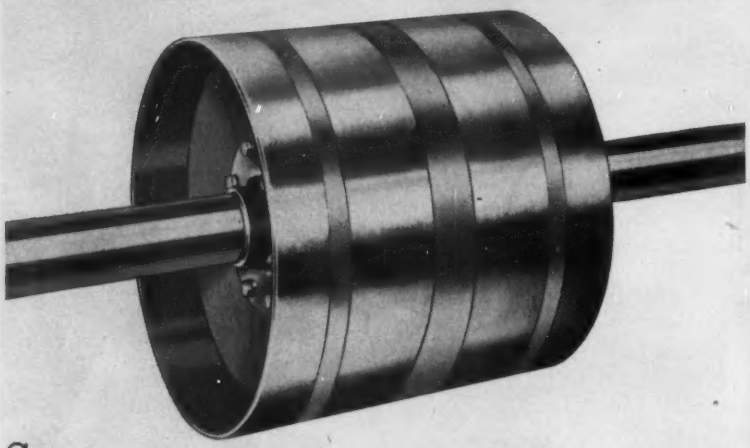
Circle 622 on Page 45

ONLY Stearns Indox V ceramic magnet pulleys give you job-proved protection



Stearns INDOX V permanent magnet pulleys are the only ceramic units field-proved on hundreds of applications in almost every industry. Both in new installations and as replacements for electromagnetic pulleys, Stearns INDOX V ceramic pulleys have performed beyond expectation as powerful stoppers of tramp iron.

RADIAL POLE DESIGN THE ANSWER

Stearns INDOX V ceramic magnet pulleys produce a powerful magnetic field that blankets the entire conveyor burden — pulling out tramp iron far more effectively than conventional units. Stearns radial pole design provides fingers of magnetism that reach out and probe every inch of the material as it speeds along the conveyor — pulling out dangerous tramp iron that could ruin process equipment and contaminate your product.

These job-proved ceramic magnet pulleys give you all the benefits of deep-field electromagnetic units with none of the extra costs. Consider these advantages: lower initial cost, no power expense, no chance of power failure, no need for rectifier, no moisture problem, minimum maintenance. Stearns Series "410" permanent magnet pulleys and Series "710" for deeper conveyor burdens are available in standard widths and diameters from 12 to 48 inches. Call your local Stearns representative for full details and a price quotation, or write for free Bulletin 1022G.

WHAT IS INDOX V?

INDOX V is a highly oriented barium ferrite ceramic material. Its energy is comparable, on an equivalent weight basis, to that of ALNICO V — the most powerful permanent magnet material available. INDOX V magnets possess unique advantages — light weight, high electrical resistivity, great resistance to demagnetization, inexpensive, non-critical raw materials — plus an energy product over three times that of non-oriented ceramic magnets. INDOX V is used in magnetic separators manufactured by Stearns exclusively.

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cations, but demand for heavy mill machinery is slow.

Malleable shops are operating at a somewhat higher level than most other foundries, averaging perhaps 65 per cent of normal, but they are running well below the general rate of a couple of months ago. Hardware and pipe fitting shops apparently have built up substantial inventories, usual schedules being three to four days a week.

Most brass and bronze foundries are doing well to maintain a 50 per cent operation. Captive shops perhaps are doing a little better on an average. Maritime work shows some improvement, particularly now that the five-month strike at the eight eastern yards of Bethlehem has been settled. Aluminum foundries are doing fairly well, reflecting a diversity of demand. However, they have not built up backlogs to any extent.

Both pig iron and scrap continue plentiful. Significantly, some furnaces in this area have closed dowr because of lack of business and prices on the major grades of cast scrap are at the lowest levels so far this year.

ADCI's 1960 Annual Meeting Will Be Held in Chicago

The 1960 annual meeting of the American Die Casting Institute and its research organization, the Die Casting Research Foundation, will be held Sept. 14-15 at the Edgewater Beach Hotel, Chicago.

Accomplishments of the past year will be reviewed and plans will be made to strengthen custom diecasting services to industry.

MHEDA Reschedules Foundry Material Handling Course

A five-day material handling course for foundry personnel, sponsored by the Material Handling Equipment Distributors Association and originally planned for June, has been rescheduled for the week of Sept. 19. The course was postponed because of numerous requests to permit greater time for arranging attendance.

Some of the lecturers for the course are Dr. Merton C. Flemings, Massachusetts Institute of Technology; Robert P. Ferguson, Plainville Casting Co.; Albert Musschoot, Car-

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Baird-Atomic Spectrometers — either the SPECTROMET® or DIRECT READER — allow high precision analysis of alloying and minor elements to be made quickly and easily. Results are reported to the melt shop in minutes permitting corrections to be made prior to pouring. Both units are specially designed for rugged, practical use . . . to be operated by semi- or non-technical personnel.

SAVE TIME, ELIMINATE WASTE, HIT SPECS ON THE NOSE

- Eliminate "off analysis" heats.
- Shorten furnace holding time — net more heats per month, minimum loss of alloy elements, longer furnace life, lower fuel costs.
- Conserve expensive alloying elements by confidently aiming at low side of the specification. Detect harmful tramp elements.
- Reduce expenses by saving manpower, supplies, and space.

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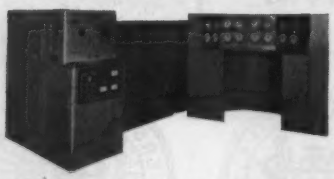
SPECTROMET — rugged model designed for installation close to the melt shop without need for special laboratory. Analyzes up to fourteen elements.



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BOTH UNITS HAVE THESE EXCLUSIVE BA ADVANTAGES

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rier Conveyor Corp., division of Chain Belt Co.; and William N. Ohlson, Draper Corp.

For more information, contact the director, MHEDA, P. O. Box 537, Newport, R. I.

Annual Meeting of GIFS Will Be in Cincinnati

The Gray Iron Founders' Society will hold its 32nd Annual Meeting at the Netherland Hilton Hotel, Cincinnati, Oct. 12-14. Theme of the two-day meeting is appraisal of both problems and opportunities in the gray iron castings industry.

One of the attractions of the meeting will be the first public showing of four new society films made with the financial aid of the American Coke & Coal Chemicals Institute, Washington. Speakers include Tom Campbell, editor, *Iron Age;* O. R. Strackbein, chairman, the Nation-Wide Committee on Import-Export Policy, Washington; James A. Wyatt and Harry Figgie, Booz, Allen, & Hamilton, New York; Dr. G. Herbert True, Visual Research Inc., South Bend, Ind., and H. W. Lownie, chief, Process Metallurgy Research, Battelle Memorial Institute, Columbus, Ohio.

Other highlights include the president's reception on Wednesday and the industry banquet on Thursday.

Alloy Casting Institute Elects Top Executives for 1959-60

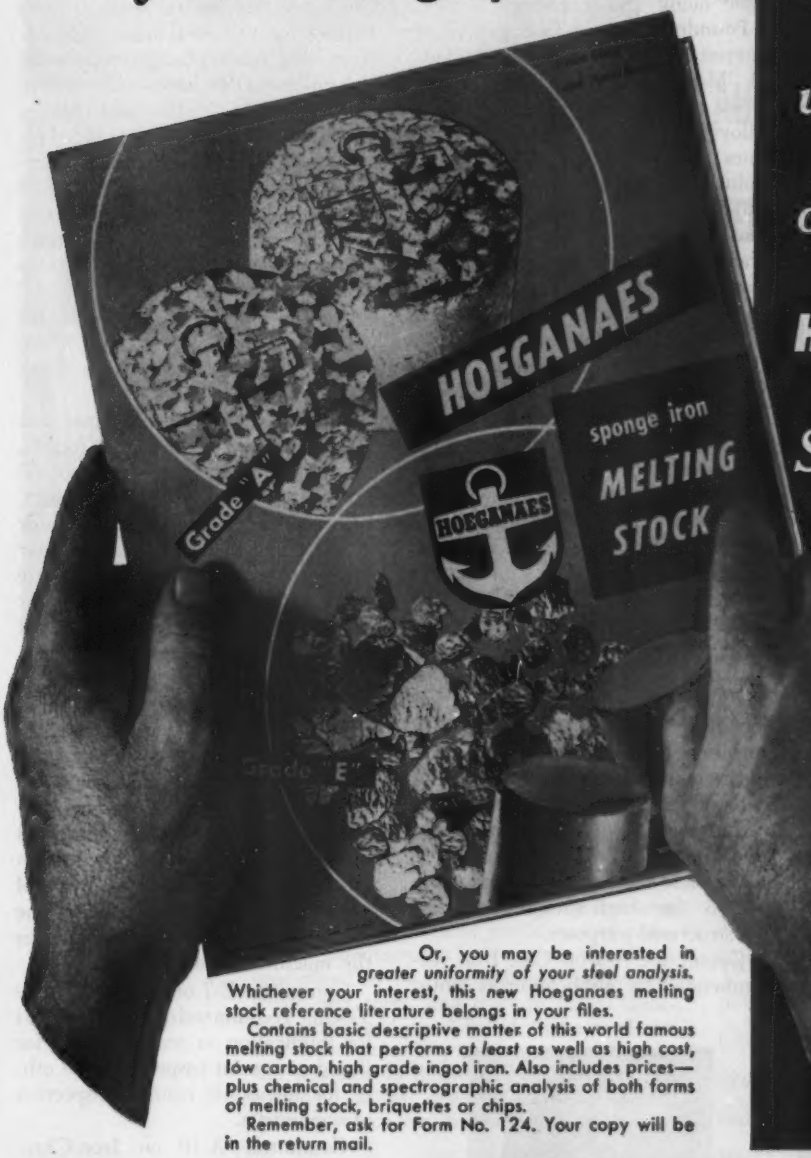
New officers of the Alloy Casting Institute were elected at the institute's annual meeting at the Homestead, Hot Springs, Va. J. D. Hagans, sales manager, Ohio Steel Foundry Co., Springfield, Ohio, was elected president to succeed J. B. Dear, sales manager, Duraloy Co., Scottdale, Pa.

Re-elected vice president was J. S. Wooters, vice president, General Alloys Co., Boston. E. A. Schoefer, Garden City, N. Y., was re-elected executive vice president and treasurer of the institute.

Two new members named to the institute's board of directors are J. K. Louden, executive vice president, Lebanon Steel Foundry, Lebanon, Pa., and J. W. MacKay, vice president-sales, American Cast Iron Pipe Co., Birmingham.

Interested in regularity of your melting operation?

If so, you'll want a copy of this new **HSIC** *Melting Stock folder -ask for Form No. 124*



Or, you may be interested in *greater uniformity of your steel analysis.* Whichever your interest, this *new* Hoeganaes melting stock reference literature belongs in your files.

Contains basic descriptive matter of this world famous melting stock that performs *at least* as well as high cost, low carbon, high grade ingot iron. Also includes prices—plus chemical and spectrographic analysis of both forms of melting stock, briquettes or chips.

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Circle 626 on Page 45

Castings Data Presented at

ASTM ANNUAL MEETING

By EDWIN BREMER
Metallurgical Editor

● NEW OFFICERS elected at the 63rd annual meeting of the American Society for Testing Materials include A. Allen Bates, Portland Cement Association, president, and Russell W. Seniff, Baltimore & Ohio Railroad, Baltimore, vice president.

The meeting was held at Chalfonte-Haddon Hall, Atlantic City, N. J., June 26 to July 1.

New directors are A. R. Belyea, Consolidated Edison Co. of New York Inc., New York; L. V. Cooper, Firestone Tire & Rubber Co., Akron, Ohio; J. C. Harris, Monsanto Chemical Co., Dayton, Ohio; J. J. Kanter, Crane Co., Chicago; R. F. Legget, National Research Council of Canada, Ottawa, Ont., and W. R. Willets, Titanium Pigment Corp., New York.

Nineteen Honored—At the president's luncheon held Tuesday, Awards of Merit were presented to 19 members of the society. James S. Vanick, consultant, Sea Girt, N. J., and formerly with International Nickel Co. Inc., received an award in recognition of outstanding and sustained service in ASTM technical work, especially the support of Committee A-3 on Cast Iron of which he was chairman for five years, and for many years of district activities. The society also recognized 50 and 40-year members; the latter group included General Steel Castings Corp., Granite City, Ill., and National Malleable & Steel Castings Co., Cleveland.

Retiring president of ASTM, Frank L. LaQue, International Nickel Co. Inc., in his address spoke on the international scope of the society and pointed out that it has members in 50 foreign countries, has received 9000 orders for publications from more than 65 foreign countries, and has been making substantial contributions to work of the International Standards Association through the American Standards Association.

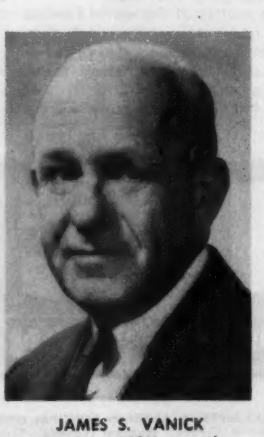
The H. W. Gillett Memorial Lecture was presented by Dr. R. C. Dalzell, U. S. Atomic Power Commission, Washington, speaking on "Nuclear Fuel Elements." Dr. Farrington Daniels, University of Wisconsin, Madison, Wis., presented the Edgar Marburg Lecture, the topic being "Solar Energy."

Foundry Topics—Two papers of interest to the foundry field included "Mechanical and Physical Properties of Five Copper-base Casting Alloys" by W. H. Johnson and J. G. Kura, Battelle Memorial Institute, Columbus, Ohio. Alloys included 76 Cu-2½ Sn-6½ Pb-15 Zn, 20 per cent nickel silver, 84-4-15 silicon brass, and 65,000 and 110,000 psi manganese bronzes.

Another paper discussed "Effects of Alloying Additions on Hot Cracking of Austenitic Chromium-Nickel Stainless Steels" by F. C. Hull, Westinghouse Research Laboratories, Pittsburgh.

Activities of various committees included that of Committee A-1 on Steel which made revisions in several specifications for steel castings. In tentative A 351-59T for ferritic and austenitic steel casting for high-temperature service, two new grades —CF 3 and CF 3M—were added, and revisions were made in A 356-58T for heavy-walled carbon and low-alloy steel castings for steam turbines. Revisions also were made in standard specifications including A 27-58 for mild to medium strength carbon steel castings for general application, A 128-33 for austenitic manganese steel castings, and in A 148-58 for high-strength castings for structural purposes.

Committee A-3 on Cast Iron recommended for publication as tentative, two new specifications, one for austenitic nodular iron castings, and the other for ferritic nodular iron casting for valves, flanges, pipe fittings, and other piping components.



JAMES S. VANICK
Receives ASTM award

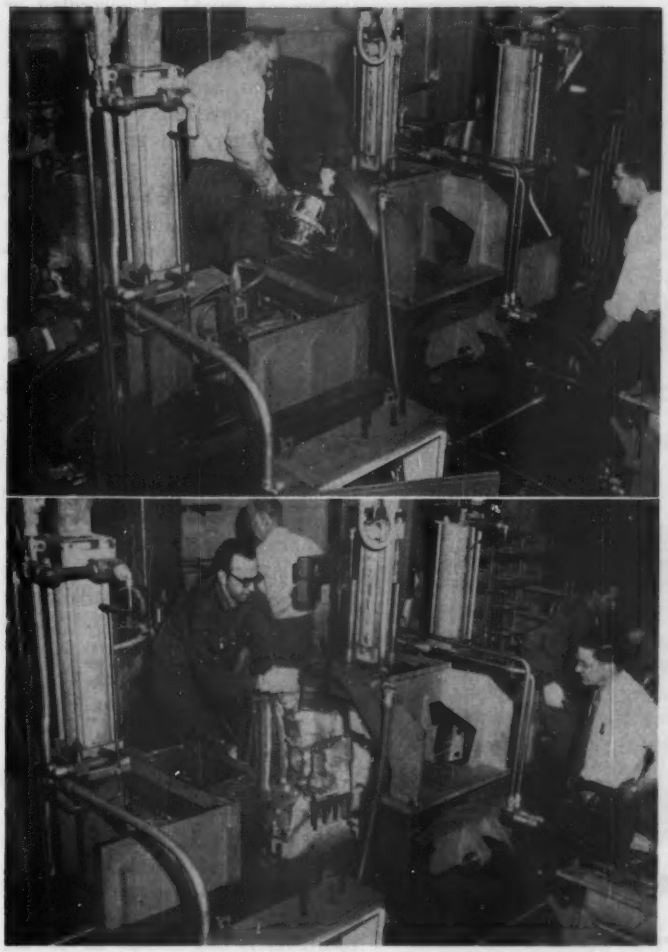
Nonferrous Revisions—Committee B-7 on Light Metals and Alloys, Cast and Wrought, recommended revisions in B26-59T for aluminum-base alloy sand castings, B 179-59 for aluminum-base alloys in ingot form for sand castings, die castings and permanent mold castings. It also was recommended that B 327-58T for aluminum alloy hardeners for zinc-base die casting alloys be adopted as a standard with a slight revision.

Committee B-5 on Copper and Copper Alloys, Cast and Wrought, recommended revisions in B 61-52 for steam or valve bronze castings, B 62-52 for composition brass or ounce metal castings, B 143-52 for tin bronze and leaded tin bronze sand castings, and B 142-52 for leaded brass and leaded semired brass sand castings.

Committee B-6 on Die-Cast Metals and Alloys recommended that tentative B 85-58T with certain revisions be adopted as a standard. A task group reporting on mechanical properties of zinc alloy test bars produced in evacuated dies indicated minor but consistent differences in mechanical properties in favor of vacuum die casting systems at the vacuum level of 17 to 20.5 in. in the machine hoods.

Committee E-7 on Nondestructive Testing recommended two methods for publication as tentative, one for liquid penetrant inspection, the other for ultrasonic contact inspection of weldments.

Committee A-10 on Iron-Chromium, Iron-Chromium-Nickel and Related Alloys recommended addition of grades CF-3, CF-3M, and CG-8M to A 296-55 for corrosion resistant iron-chromium and iron-chromium-nickel alloy castings for general application. Also it recommended addition of grades HD, HL, and HN to A 297-55 for heat-resistant iron-chromium and iron-chromium-nickel alloys for general application.



Top illustration shows two men pouring aluminum into a permanent mold of a transmission case. Bottom picture shows the finished casting being ejected after the molds have opened

SELF CONTAINED AUTOMATICALLY CYCLED PERMANENT MOLD MACHINE PRODUCES 23 LB ALUMINUM CASTINGS

Because of the ever increasing size of aluminum castings used in the automotive industry, the PERMANENT MOLD DIE CO. devoted a lot of time and effort toward the development of automatically cycled permanent mold machines for the production of large automotive aluminum castings. The one pictured here is of minimum weight. Machine can accommodate larger castings. This automatically cycled machine is the perfect answer to all those questions. Check these points:—Fully automatically cycled and self lubricated—Variable timing—Nonflammable hydraulic system, water cooled—Automatic casting ejection. These machines have been developed and proved only recently, but the profits they have made for users are already in the records. If you are interested in the economical production of large aluminum castings on a given number per day basis, you might want to ask us about our machines.

The Permanent Mold Die Company has long earned the respect and confidence of automotive manufacturers. For years they have specialized in the production of permanent molds and cores, and die cast dies. Qualified engineering and foundry personnel can tackle and solve any permanent mold problem you care to throw at them. Best of all, company prices are well within reason. Delivery, of course, is always on time.

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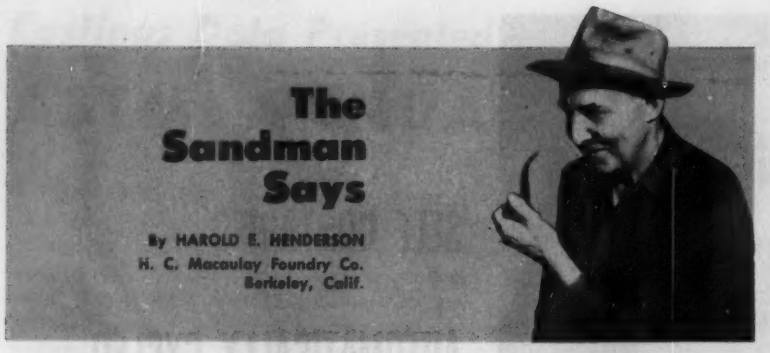

The Sandman Says

By HAROLD E. HENDERSON
H. C. Macaulay Foundry Co.
Berkeley, Calif.

"Empirical Research"

● THE AVERAGE jobbing foundryman operates without benefit of most of the apparatus of a modern laboratory. He must strive to solve his problems by methods that he has inherited or has developed or has borrowed from available authorities. In the end, he usually resorts to a compromise.

In judging the workable properties of molding sand, he no longer throws it forcibly against the cupola shell, rubs it against his shovel handle, or blows tobacco smoke through it. Nor does he subject it to a 50-power glass, ultraviolet rays, or any of the other complicated tests heralded by some members of the industry.

Our jobbing foundryman has equipment capable of recording or reporting the practical information immediately required, such as moisture content, certain strengths, permeability, percentages of clay and volatile matter, and grain distribution.

He usually is unable to measure tensile strength, although this information could prove most significant. He knows very little about hot strength or the unpredictable behavior of a mold face under the constantly changing conditions imposed by molten metal at varying degrees of heat. In other words, he has considerable information, but never enough.

The foundryman's problems are innumerable, but most if not all of them are susceptible of solution. At the moment I have one in mind which is, paradoxically, both simple and complex. Perhaps all of us have been plagued at one time or another by contaminated molding sand. The contaminating element could have been metal, charred wood, other refuse, a coarser or finer or incompatible core sand, or perhaps some unbaked bond.

Shell Cores in System Sand—Since the advent of shell molding, and, in particular, since the use of shell cores in green sand molds, controversy has arisen as to the probable effect of this mixture on the properties of system sand.

Even with manual shakeout, and the exercise of cautious casting removal, for example, some burned core sand from conventional oil sand cores, which collapse only partially, runs or is spilled into the system.

With shell cores, however, the collapse is practically complete; the greater part of the core is lost as the casting is removed from the mold. In fact, it would be more accurate to say that the shell core is "saved" in the system, becoming an active agent therein.

The question is, are these disintegrated shell cores beneficial or injurious to casting finish? If the grain size of the shell core sand approximates that of the base system sand, is there cause for concern? Is it possible that some of the resin binder has not been destroyed, or even is unbaked and that by expelling gas it causes any of a number of defects? At least one found-

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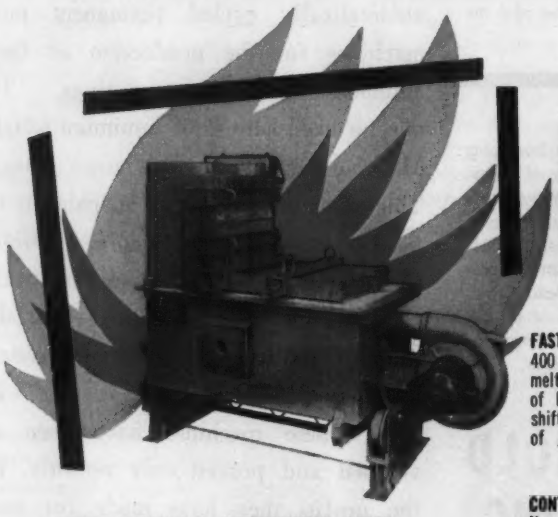
FUEL SAVINGS UP TO 50% REPORTED USING REDA GAS-OIL FIRED FURNACES!



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FASTER MELTING — One 400 series Reda Furnace melts up to 11,000 lbs. of brass or bronze per shift, and up to 6,000 lbs. of gray iron per shift.

CONTINUOUS POURING — No waiting until floors, flasks, boards, etc. are filled with molds!

LOWER MELTING & MAINTENANCE COSTS — One man can operate a Reda Furnace . . . No daily repairs needed!

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HINES MEDIUM "POP-OFF" FLASKS

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One of many ***HINES*** *developments contributing to better foundry production*

- Jig and fixture built for maximum accuracy and strengthened with the familiar HINES diagonal ribs.
- No need for hammering to remove the flask from the mold — simply move levers and off it pops!
- Two-part flasks equipped with standard "POP-OFF" locking assemblies. Flasks with one or more upsets (3" or deeper) equipped with new clevis-locking assemblies for *simultaneous opening of all flask sections.* (See upper photo.) Also recommended for flasks used with cope and drag pattern plates and flasks used on "Rota-Lift" machines.
- Lengths and widths from 10" to 24". Depths from 7½" to 14". Single or double, round, hex or "V" pins, bushings or guides—or pads for your own pins.

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THE HINES FLASK CO.

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HINES FLASKS

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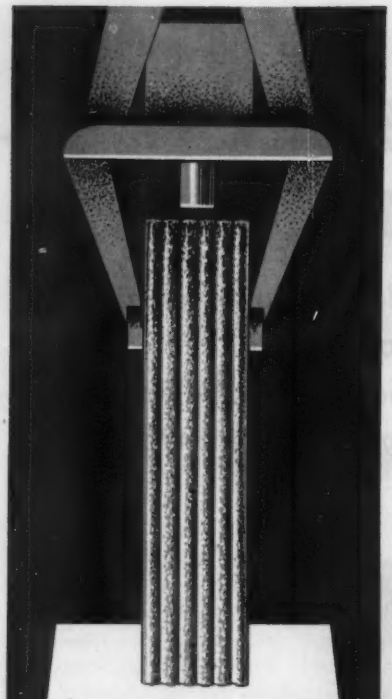

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A few PQ Silicates which may have special interest to you:

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PQ silicates have been produced for a century. You are welcome to draw on this long experience.

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Circle 630 on Page 45

ryman I know claimed that his system sand was being ruined by this infiltration. Others were highly doubtful.

First Test—At my plant we decided that if a small amount of this burned shell core sand is injurious, more of it should magnify the condition. Acting on this assumption, we collected 100 lb of it from the castings at shakeout. This material was put through a ½-in. screen similar to that used in our large sand preparation unit. We then added 6 per cent southern bentonite and water to a workable feel, then mulled the mix for ten minutes.

The test reading for this mix was as follows: Permeability, 150; green compressive strength, 9.6 psi; green shear strength, 2.7 lb; deformation, 0.027; final moisture, 4.25 per cent.

This shell core sand supposedly is an AFS No. 70, which compares favorably with our system base. As mulled for molding, the test mix contained no seacoal or woodflour and at 4.25 per cent moisture was wet to the feel. It was used in this condition, rammed hard, and no graphite or other coating was applied to the mold surface.

We expected that the casting would reveal one or more defects, but we were not in the least disappointed to find none. The absence of seacoal and woodflour probably, however, was responsible for the gray, slightly rough finish, although the casting compared quite favorably with our run-of-the-mill work. We also should remember that our moisture seemed high at 4.25 per cent.

Whether that would have affected casting finish adversely is a moot question, at least with me, for my empirical research has not covered this phase of the question. It would seem logical, however, to believe that a more nearly optimum moisture—say 3.75 per cent—would improve flowability, and hence mold hardness, and that the resulting casting finish should benefit.

I must observe, as you will, that these tests are crude, brief, and undoubtedly inconclusive. We have only a skeleton sample of a model laboratory, with not even a sample of its personnel.

Our continued existence depends on our ability to produce sufficient quantities of salable castings under competitive conditions. Anything which interferes with this aim is frowned on, and our research program is held to the irreducible minimum.

Second Test — We wanted to know a little more about this burned shell core behavior in our system, however; therefore we made a second test. Another 100 lb of this questionable material was mulled with 8 lb of southern bentonite, 3 lb of seacoal, 0.5 lb of woodflour (soft), and water to a total of 3.75 per cent. This mix was mulled dry for 5 minutes, then for an additional 5 minutes after the water had been added. Because the mix was too dry to the feel, we added 0.25 per cent water and continued mulling for an additional 5 minutes.

Even at 4 per cent, the mix was on the dry side. But it was moldable, and we used it in a mold rammed to 80 to 85 mold hardness and poured hot. Surface finish was slightly superior to what we have come to accept as normal—probably as smooth as reasonably could be expected from a No. 70 sand.

Our test of this sand, as it was prepared for molding, gave these results: Permeability, 75 (a reduction of 50 per cent due to seacoal, woodflour, lower moisture, and perhaps extra mulling); green compressive strength, 11.8 psi; green shear, 3.0 lb; deformation, 0.021. Our chemist informs me that a representative sample of this burned shell core shows a 1.7 per cent loss on ignition and 8.8 pH, neither of which in our experience could be considered ominous.

Third Test—I shall stop with my third test because I feel that I learned what I wanted to know, at least at present.

Again using 100 lb of the burned shell core sand, I added 6 lb of western bentonite, 5 lb of seacoal (an increase of 2 per cent), 1 lb of woodflour (a 100 per cent increase), and 6.4 per cent moisture (an increase of almost 2 per cent).

The sand and other dry ingredients were mulled for 5 minutes. Water was added, and mulling continued for 15 minutes more. Testing showed these properties: Permeability, 45; green compressive

Circle 631 on Page 45→

strength, 9.8 psi; green shear, 2.4 lb (indicating a lower tensile); deformation, 0.028; moisture, 6.4 per cent.

Although the mulling time we used in our final experiment may seem unnecessarily long, and the moisture unreasonably high, the sand did not feel wet, nor was the strength excessive. Changing the amounts of the two bentonites unquestionably distorted the picture. The extra water conceivably could be responsible for the reduced strength and higher deformation, but without it, the stuff would have been unmoldable. The casting finish produced in this third experiment was markedly superior.

From the foregoing experiments I am reasonably convinced that sand from shell cores in no sense harms our system.

Steel Founders' Society Names 1960-61 Committee Chairmen

Chairmen and committee members for 12 standing committees of the Steel Founders' Society of America have been named by the society's board of directors. The following men have been selected to serve as chairmen during 1960-61:

Advertising and Public Relations Committee, M. J. Allen, American Steel Foundries; Bridge Castings Task Force Committee, G. C. Samson, Omaha Steel Works; Budget Committee, W. H. Moriarty, National Malleable & Steel Castings Co.; Handbook Committee, W. W. Heimberger, Buckeye Steel Castings Co.; Management Accounting Program Committee, H. L. McClees, Crucible Steel Casting Co.

Market Research Committee, A. M. Slichter, Pelton Steel Casting Co.; Program Evaluation Committee, C. E. Grigsby, American Steel Foundries; Product & Market Development Committee, J. A. Bray, Mackintosh-Hemphill Div., E. W. Bliss Co.; National Policy Information Committee, J. Keith Louden, Lebanon Steel Foundry; Safety Committee, J. D. Holtzapple, Blaw-Knox Co.; Specifications Committee, R. H. Frank, Bonney-Floyd Co.; Technical and Operating Committee, D. L. Hall, Oklahoma Steel Castings Co.: Technical Research Committee, V. E. Zang, Unitcast Corp.

Reservation Review
VOTERS ACCLAIM KEOKUK—KEMCO
KEOKUK, IOWA . . . Galloping Poll shows Chief Keokuk the coast-to-coast choice.
Says Mr. Galloping, "It looks like Campaign Managers Princess Wenatchee and Junior have a sure winner in Chief Keokuk who heads the Kemco Silvery ticket. Foundrymen and steel men know the Chief and they know that Kemco Silvery is the superior form of silicon introduction. When they vote, they'll vote for Chief Keokuk."
CANDIDATE KEOKUK

KEMCO SILVERY PIG IRON

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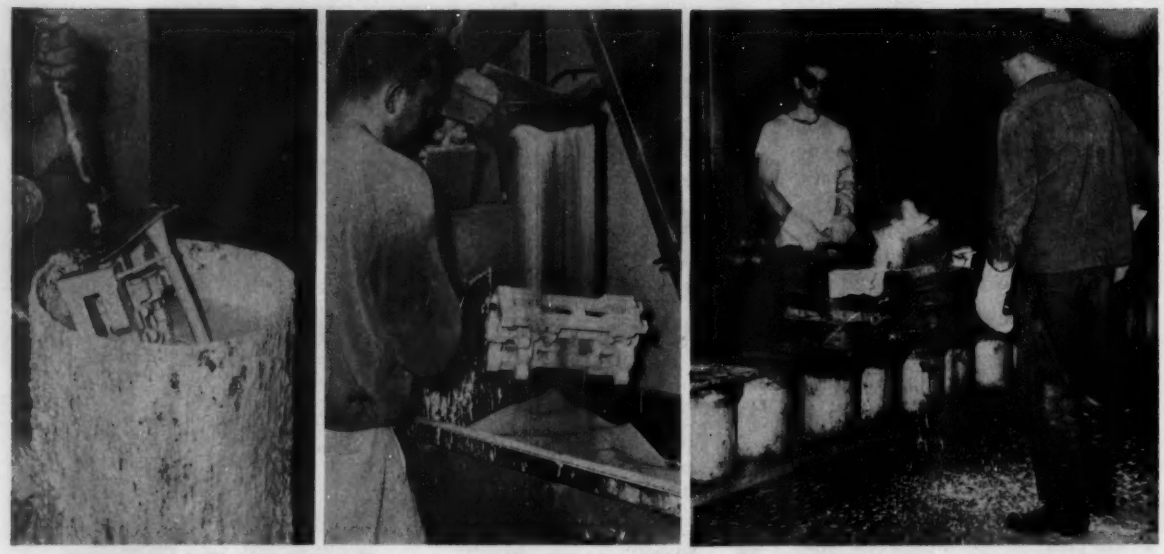
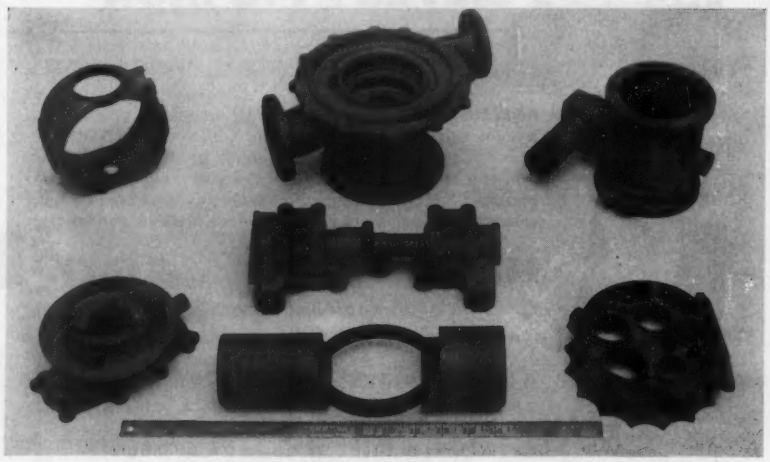


To make ceramic shell investment molds, the pattern-gating system setup is dipped in a slurry, at left, stuccoed with granular refractory, center, then supported upright in sand for pouring, right. Dipping and stuccoing operations are performed a number of times to provide a shell of proper thickness

CERAMIC SHELL PROCESS... To Expand Investment Castings Market

By ROBERT H. HERRMANN
Associate Editor

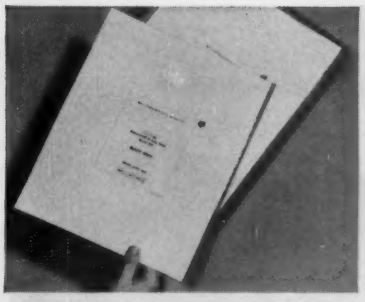
● MANAGEMENT of Arwood Corp., New York, expects the recently developed ceramic shell investment process to bring a new phase of growth and expansion to the corporation and the entire investment casting industry. Arwood's shell investment technique, put into production about a year and a half ago, now is being used in the company's five foundries—in Brooklyn, N. Y.; Groton, Conn.; Tilton, N. H., and Los Angeles and LaVerne, Calif.



Typical castings show complex shapes and size range of parts being produced by Arwood in shell investment molds

The increased use of investment castings is expected to result from the fact that the ceramic shell process produces larger castings than the older flask investment process. An example is a slide cast by Arwood for a valve opening mechanism. It is about 39 x 5 x 1½ in. and weighs 79 lb. Metal used is Stellite, and it is cast in a ceramic shell produced around a wax pattern.

Additional advantages claimed for the process are: Complex castings can be produced with very intricate



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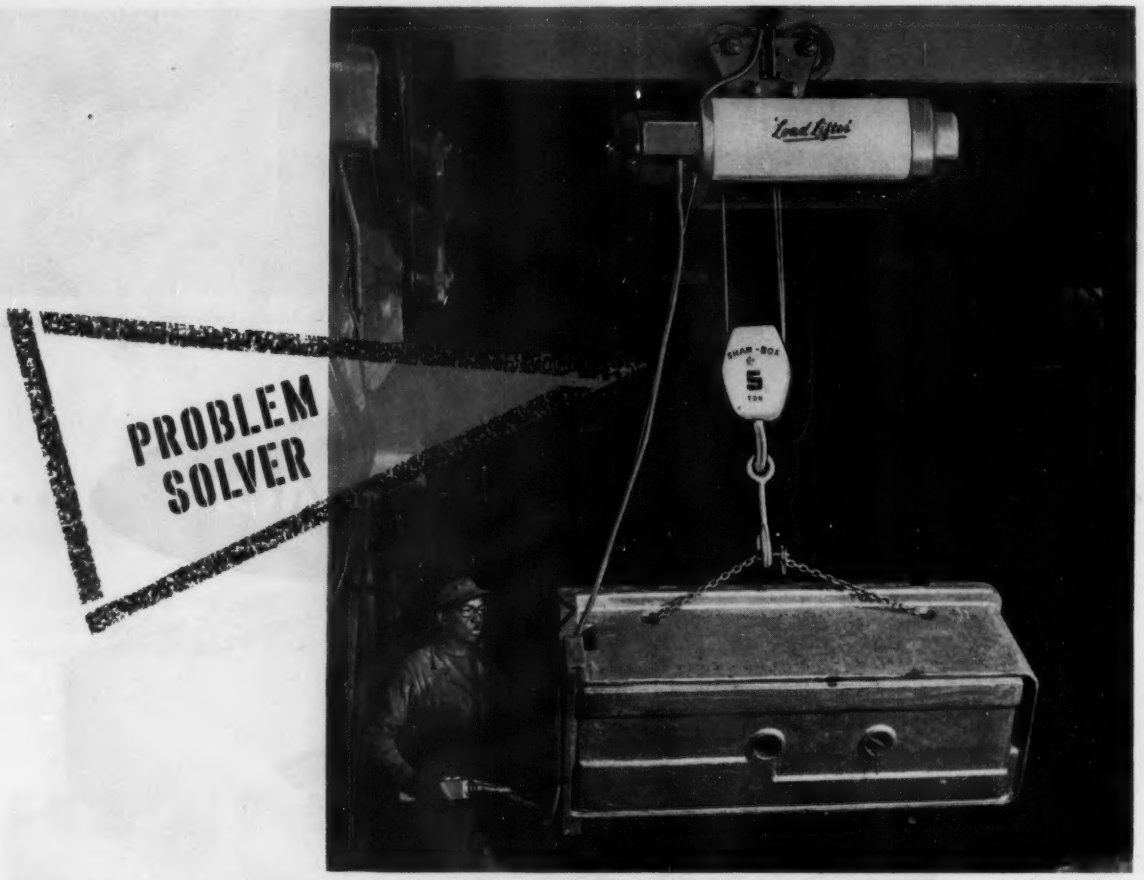

Foundry cuts costs with 2-speed Load Lifter® Electric Hoists

Load Lifter Series "700" Wire Rope Electric Hoists. ½ to 15 tons. Fast, heavy-duty hoists with two automatic brakes and safe 24 volts at the push-button control. Two-speed models for handling fragile loads safely. Lug suspension and push, hand-geared and motor-driven trolleys available. Hi-hook model increases length of lift.

Load Lifter Series "800" Wire Rope Electric Hoists. ½ and 1 ton. Low headroom construction. Tough, lightweight hoists that speed production processes. Separate load and motor brakes act simultaneously. Single and two-speed models with 24-volt push-button stations. Lug or hook suspension; push and motor-driven trolleys available.

60 F2

There is everyday economy in this picture. It is the economy a midwest foundry realizes from the problems solved by 2-speed Load Lifter Electric Hoists.

These powerful hoists have a slow speed for "creeping" with fragile loads. It provides "gentle" handling for setting cores, drawing patterns, and closing flasks — the slow action that prevents damage and spoilage.

For fast hoisting in "all clear" areas, pushing a button triples the speed. Handling time is saved at shakeouts, tumbling barrels, and sand blasting machines. For example, 1 ton can be lifted 1 foot in 1 second. Speed doesn't vary with the load. And, Load Lifter Hoists have two brakes to assure smooth "hairline" stops for accurate load spotting.

The problem-solving ability of 2-speed Load Lifter Electric Hoists can bring new economy to *your* foundry operations. Phone your nearby Shaw-Box Distributor for details. Or write for Bulletin 15025-1C.

LOAD LIFTER ELECTRIC HOISTS

A product of

MANNING, MAXWELL & MOORE, INC.

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In Canada: Manning, Maxwell & Moore of Canada, Ltd., Galt, Ontario

coring; the absence of flask size restrictions permits freedom in engineering the pattern setup, resulting in better gating practices and generally sounder castings; castings have fine grain size and consistently smooth surface finish.

The Groton foundry produces only steel castings, and 20 to 25 per cent of production is in shell. The rest is in flask molds. On the average, tolerances on castings produced in shell are ±0.003 to ±0.005 in./in., depending on size and configuration of the part and on the alloy. Yield on the intricate parts being cast is indicated by the gating-casting weight ratio of 2:1 to 8:1, the average being 4:1. The average scrap rate runs 12 to 15 per cent.

Ninety per cent of castings production at Groton is for aircraft frames and engines, missiles, and rockets. Balance of production is for shoe machinery, industrial knitting machines, the can manufacturing industry, business machines, and surgical equipment producers.

Makes Own Dies — A well-equipped machine shop makes almost all of the pattern dies used at the plant. Most dies are produced by casting a low-melting-point Sn-Bi-Pb-Cd alloy around a machined metal replica of the desired casting. These dies have a life of about 75,000 wax pattern injections. Dies are produced in a similar manner for making water-soluble wax cores used in casting many parts.

Models for the dies are machined from low-alloy steel or magnesium. Occasionally steel inserts are used in magnesium dies at areas of close dimensional tolerance. Prototype work in connection with part design also is done with machined metal models.

Formulate Own Wax—The heat-disposable material used for patterns is blended at the foundry. It consists of several types of waxes with polystyrene added occasionally to control volumetric shrinkage.

Experiments are being conducted on a system for piping wax to the 13 injection machines in the pattern-making room. Incorporated in the system are a cylindrical, heated container for maintaining wax at 140° F. A pneumatic piston at the top of the tank pushes the molten wax through the 1-in.-diam pipe system, maintaining a constant pressure of 150 psi. All pipe is wrapped with resistance wire heaters to maintain the wax at 140° F. The system is intended to eliminate wax reservoirs and injection devices at each machine. Pressure reducing devices, however, are used at machines where a wax pressure of less than 150 psi is desired for certain pattern dies.

Standard Gating Used

Extensive use is made of standard wax sprue and runner shapes during assembly of pattern setups. These generally are produced from salvaged wax. The usual square, round, and rectangular cross-sectional pieces are made with parallel or tapered sides. Tapered side pieces are used in gating larger castings, generally when section sizes of 1 or more inches must be fed. Tapered feeding system components are intended to pressurize the system in the same manner recommended for sand casting practice. In addition to the standard shapes, prefabricated sprue-runner systems are made for castings produced in large quantities.

Bolts are embedded in the sprues of pattern setups, and metal handles threaded on the bolts facilitate handling during subsequent dipping and stuccoing operations.

Shell Making—The method of making ceramic shell investment molds at Groton is similar to that used in other foundries. Slurry and stuccoing materials involve silica sol binders and fused silica flour refractories for the slurry and fused silica granules for the stucco coats.

Shells are made by hand dipping a pattern in the slurry and sieving the stuccoing material on the wet slurry coat. Approximately six layers are formed by alternate dipping and stuccoing. The resultant shell is about ¼ in. thick.

The first slurry coat is stuccoed with fine refractory grain and dried about 4 hr in an atmosphere maintained at 70-75° F and 40 per cent relative humidity. Subsequent coats are built up of alternate layers of slurry and coarser stucco material with no drying time between each. The final coat is a wash coat of slurry with no stucco material. Its purpose is to prevent the last stucco material from rubbing off and pos-

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Circle 639 on Page 45

sibly getting in the mold cavity. Finished shells are dried for 24 hr in the company's controlled atmosphere room.

Dried molds are flask fired at 1800° F for 4-5 minutes by placing them, pouring basin down, on a heavy wire grid in removable top ovens. Most of the wax falls from the mold in these ovens. The hot shells then are transferred to other ovens to be cured at 1600° F for 35-40 minutes.

Pouring Practice — Molds are poured as they come from the curing ovens, after they have cooled, or after they have cooled and been reheated. Just how they are poured depends mainly on flowability characteristics of the alloy being poured. The molds are nestled in sand to hold them upright during pouring.

Most Molds Are Air Poured

Most ceramic shell investment molds are poured in air with hand ladles and depend on gravity for proper feeding. In addition, exothermic materials are put on risers to keep the metal fluid. Molten metal is supplied by four 100-lb induction furnaces. A few molds are poured on clamp-tilt arc furnaces of 20-lb capacity. Ocassionally air or argon is introduced under pressure behind the metal in the furnace to force it into the mold. Some molds are sealed up to the pouring basin in containers and subjected to suction to provide a vacuum assist in pouring.

Heat Treatment—After cooling, the casting is cleaned, cut off, heat treated, and finished in the conventional manner. The Groton plant emphasizes the role of heat treatment to obtain desired properties in cast parts. Ninety-five per cent of castings produced are heat treated.

Equipment includes four batch ovens, two of which are equipped for controlled atmosphere work, and two subzero treatment boxes. Castings placed in one of the boxes with dry ice can be brought down to −40° F. A −80° F temperature can be achieved by putting the castings in a container with acetone and placing the container in a cold box. Subzero treatments are used for grain orientation in castings and are followed by aging in an oven.

YOUR DOLLAR CAN HELP THE U.S. TEAM WIN IN ROME

The possibility of the U.S. team winning the 1960 games in Rome this year depends to a great extent on what funds are available. The team needs money to help it achieve championship status. Many other countries, like Russia, finance their Olympic teams with government subsidies. The U.S. does not do this. Your dollar is needed. It is needed now to help the U.S. team win at Rome!

Get this souvenir postcard mailed to you direct from Rome, Italy

To acknowledge your contribution, arrangements have been made to send a special Olympic souvenir postcard to you or anyone you may specify. This postcard will bear a special Italian commemorative Olympic stamp. It will be mailed direct from Rome, Italy to you or anyone you specify . . . and will be autographed by leading members of the U.S. team.

The U.S. team needs funds to help them seek out the top U.S. athletes. To train them. To transport them to Italy. And to feed, clothe and house them while they are participating in the Olympic Games. You and others like you are the sole support of the U.S. team. Please mail your contribution today.

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Olympic, National Headquarters, Olympic House, 57 Park Ave., New York 16, New York

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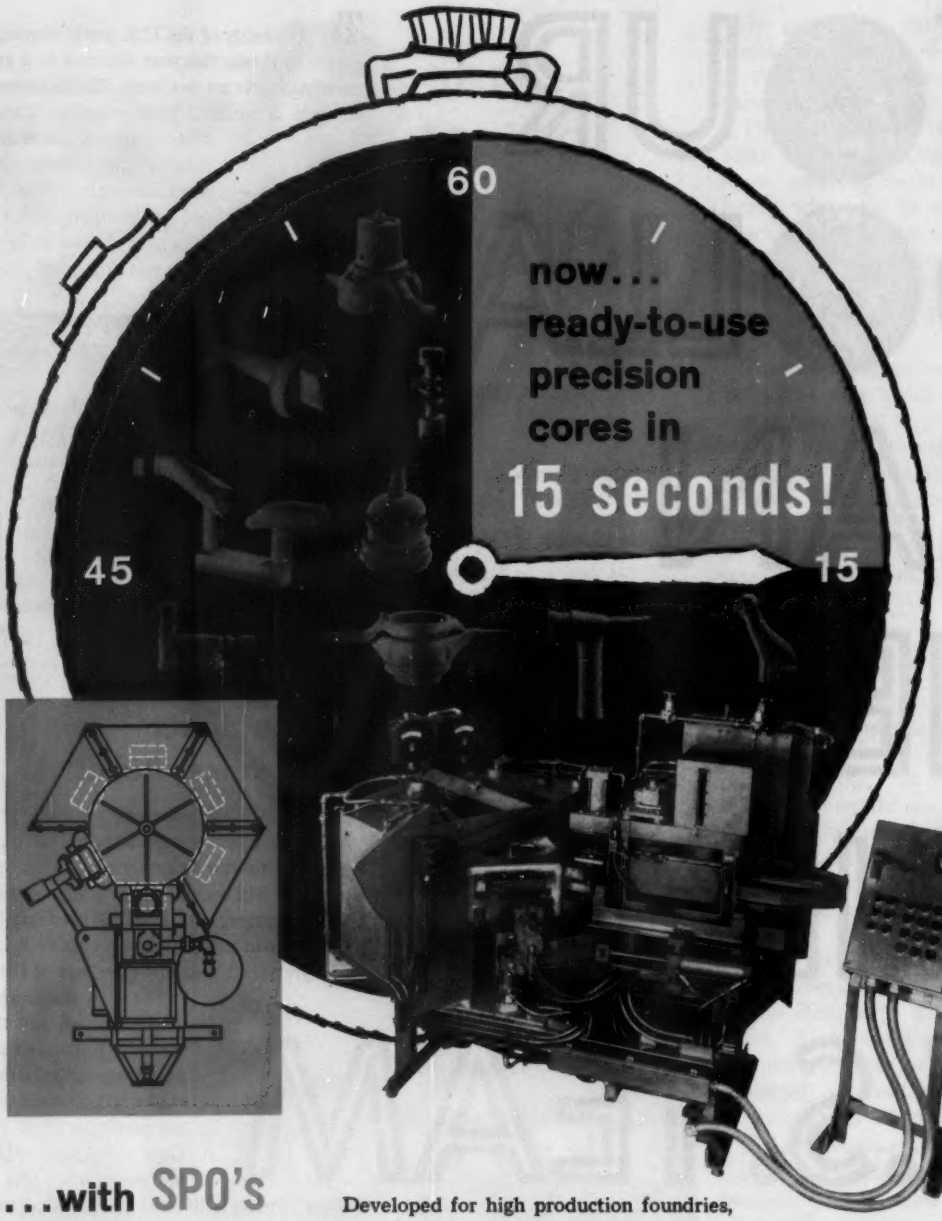

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Literature for Foundrymen

For More Information Use Reply Card—Page 45

Investment Casting Process

Fact Sheet describes the Shaw Refractocast Process of investment casting. Steps in the process are illustrated, and castings made by the process are shown—Shaw Process Development Corp., division of British Industries Corp., 80 Shore Rd., Port Washington, N. Y.

For More Details Circle No. 406—Page 45

Bandsaw

Eight-page catalog shows Model 2624-5 band mill. Specifications and various applications are included in Form 59-66.—DoAll Co., Des Plaines, Ill.

For More Details Circle No. 407—Page 45

Box Dumper

Universal drop bottom box dumper is illustrated and described in this bulletin, Circular No., 7032.—Little Giant Products Inc., 1530-50 N. Adams St., Peoria, Ill.

For More Details Circle No. 408—Page 45

Diecasting Trimming

Article on eliminating scrap parts in diecasting trimming by using four column multipresses is published in *Denison Hydraulic Review*, Vol. 9, No. 1.—Denison Engineering Div., American Brake Shoe Co., 1160 Dublin Rd., Columbus 16, Ohio.

For More Details Circle No. 409—Page 45

Coreboxes

Leaflet describes company's services as a producer of coreboxes and drier patterns by pressure casting.—Scientific Cast Products Corp., 1390 E. 40th St., Cleveland, Ohio.

For More Details Circle No. 410—Page 45

Variable-Speed Sheaves

Technical data are included in eight-page Bulletin 6102, on variable-speed sheaves.—T. B. Wood's Sons Co., Chambersburg, Pa.

For More Details Circle No. 411—Page 45

Magnetic Equipment

Bulletins MD-200, MS-250-1, and PY-260 describe permanent magnetic drums, hand sweepers, and pulleys.—Homer Mfg. Div., Ohio Electric Mfg. Co., Lima, Ohio.

For More Details Circle No. 412—Page 45

Palletized Tanks

Tanks for storing or mixing core or mold coatings are described in bulletin. They are mounted on pallets for easy movement.—Leeco Corp., P. O. Box 98, Madison, Ohio.

For More Details Circle No. 413—Page 45

Aluminum Alloy Modifier

Leaflet B9 describes Napac, a vacuum-processed metallic sodium sealed in air-tight containers for use in modifying aluminum-silicon alloys.—Foundry Services Inc., P. O. Box 8728, Cleveland 35, Ohio.

For More Details Circle No. 414—Page 45

Flask Service Unit

Illustrated bulletin describes features of a flask service unit for checking, repair, reshaping, and adjustment of steel foundry flasks.—Beloit Products Co., P. O. Box 994, Beloit, Wis.

For More Details Circle No. 415—Page 45

Conveyors

Specifications and applications of several conveyors are given in Catalog C-1.—Simplicity Engineering Co., Durand 7, Mich.

For More Details Circle No. 416—Page 45

Dielectric Core Ovens

Bulletin 660 details line of Coleman dielectric core ovens and describes installations already in operation.—Foundry Equipment Co., 1831 Columbus Rd., Cleveland 13, Ohio.

For More Details Circle No. 417—Page 45

Metal Removal Electrodes

Pamphlet describes electrodes to be used with metal removal torches.—Arcair Co., P. O. Box 431, Lancaster, Ohio.

For More Details Circle No. 418—Page 45

Did You Miss These?

Here is a list of popular literature items offered in recent months:

BERYLLIUM IN ALUMINUM ALLOYS (Bulletin 12)—Brush Beryllium Co., Cleveland 3, Ohio. Circle 402, Page 45

STAINLESS STEEL, HIGH ALLOY—International Nickel Co., Readers Service Section, New York 5, N. Y. Circle 403, Page 45

CO_2 PROCESS—Frederic B. Stevens Inc., 1800 18th St., Detroit 16, Mich. Circle 404, Page 45

CAST ALLOY DESIGNATIONS—Alloy Casting Institute, Garden City, N. Y. Circle 405, Page 45

Foundry Refractories

Eight-page brochure H-W 560 describes refractories for cupolas, electric furnaces, malleable furnaces, nonferrous metal furnaces, and pouring equipment. Other refractories also are described.—Harbison-Walker Refractories Co., 307 Fifth Ave., Pittsburgh 22, Pa.

For More Details Circle No. 419—Page 45

Gas Preparation Units

Gas preparation units Model CU 500 and Model CU 2000 for mixing gas and air are described in Bulletin HD-349R.—Hevi-Duty Electric Co., P. O. Box 563, Milwaukee 1, Wis.

For More Details Circle No. 420—Page 45

Dock Bumper

Specification sheet gives data on two models, C-818 and C-818-S, of Flex-O Bumperette, a truck dock bumper.—Bumpers Inc., 2534 Detroit Ave., Cleveland 13, Ohio.

For More Details Circle No. 421—Page 45

Induction Motors

Induction motors up to 400 hp are discussed in illustrated brochure. Various construction details are shown.—Elliott Co., Crocker-Wheeler Plant, Jeannette, Pa.

For More Details Circle No. 422—Page 45

Lift Trucks

Operating data are included in "Operator's Guide" which is part of a safety kit for users of lift trucks. Safety cartoons and route posters also are in the kit.—Towmotor Corp., 1226 E. 152nd St., Cleveland 10, Ohio.

For More Details Circle No. 423—Page 45

Air and Hydraulic Cylinders

Pricing booklet contains prices and data on air and hydraulic cylinders and boosters.—Miller Fluid Power Div., Flick-Reedy Corp., York and Thorndale Roads, Bensenville, Ill.

For More Details Circle No. 424—Page 45

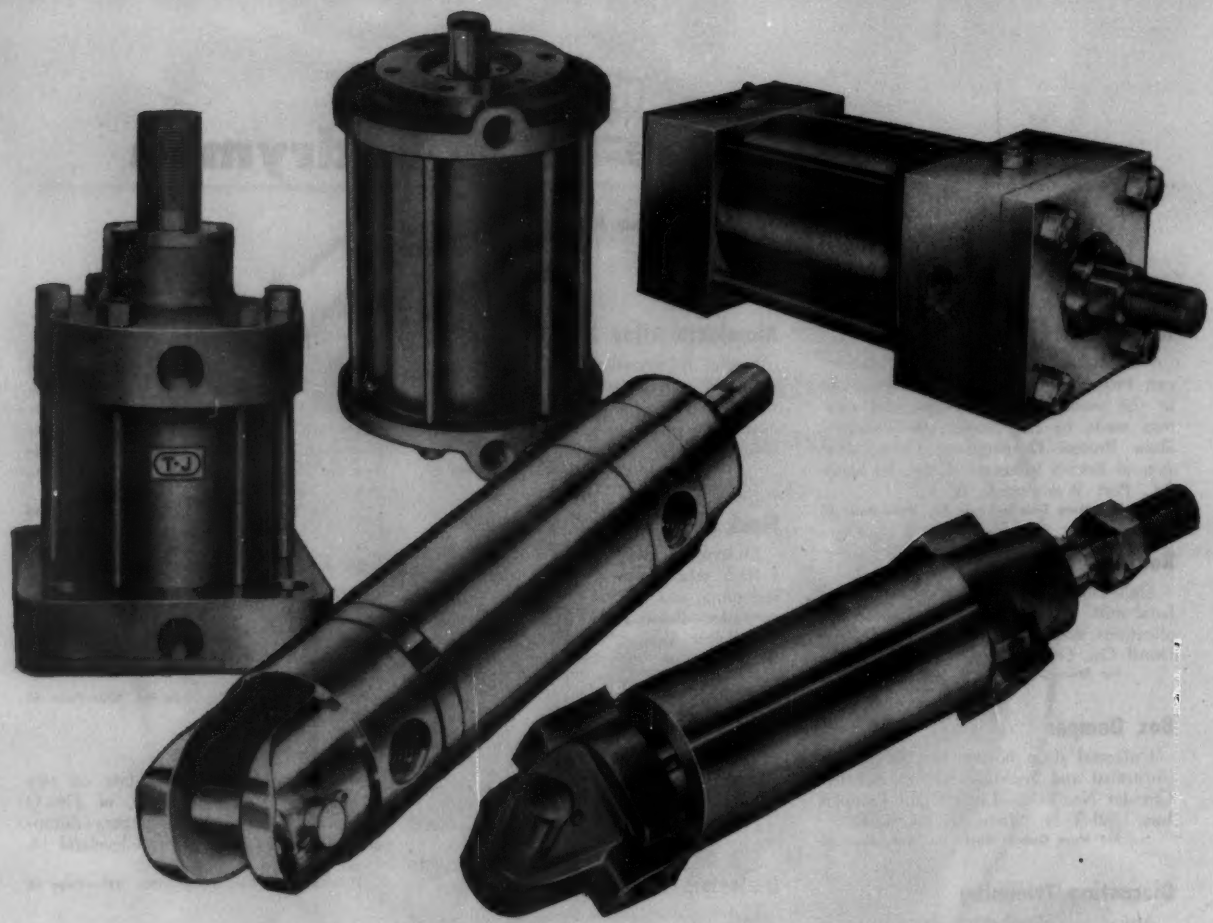
Polishers

Polishers and accessories for metallography are listed in Issue 2, Volume VI of *Metal Digest*.—Buehler Ltd., 2120 Greenwood St., Evanston, Ill.

For More Details Circle No. 425—Page 45

Hot Blast Operation

Bulletin 2000 details important economic and quality control advantages obtainable by using hot blast cupola air preheaters. Drawings, specifications, and pho-



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Circle 642 on Page 45

tographs of recent installations are included.—**Brown Metals Inc.**, subsidiary of Brown Fintube Co., 300 Huron St., Elyria, Ohio.

For More Details Circle No. 426—Page 45

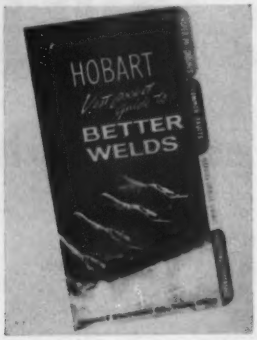
Belt Conveyor Idler

Illustrations, descriptions, and technical data on Series 200 Limberoller belt conveyor idler are contained in 20-page Bulletin LD-111.—**Joy Mfg. Co.**, Oliver Bldg., Pittsburgh 22, Pa.

For More Details Circle No. 427—Page 45

Arc Welding

Eighty pages of arc welding information are contained in "Vest Pocket Guide



to Better Welds."—**Hobart Bros. Co.**, Troy, Ohio.

For More Details Circle No. 428—Page 45

Battery Chargers

Bulletins 237, 236, and 203 cover industrial automatic battery chargers, nonautomatic trickle chargers, and nonautomatic battery chargers, respectively.—**Automatic Switch Co.**, 56-A Hanover Rd., Florham Park, N. J.

For More Details Circle No. 429—Page 45

Material Handling Equipment

Fourteen-page booklet describes material handling equipment including racks, pallets, skid platforms, box and barrel grabs, trucks, worktables, storage bins, carts, and boxes.—**Palmer-Shile Co.**, 16033 Fullerton Ave, Detroit 27, Mich.

For More Details Circle No. 430—Page 45

Spectrophotometer

Bulletin 779 features technical information on Model DB Ultraviolet Spectrophotometer.—**Beckman Scientific & Process Instruments Div.**, Technical Information Dept., 2500 Fullerton Rd., Fullerton, Calif.

For More Details Circle No. 431—Page 45

Insulated Thermocouples

Catalog 602 features metallic sheathed, hard packed, oxide insulated thermocouples and extension wire. Optional terminals and attachments also are described.—**Marlin Mfg. Corp.**, 12404 Triskett Rd., Cleveland 11, Ohio.

For More Details Circle No. 432—Page 45

Hydrogen Atmosphere Furnaces

Full-muffle, hydrogen-atmosphere, handpusher furnaces are described and illustrated in Bulletin No. 260.—**Lindberg Engineering Co.**, 2453 W. Hubbard St., Chicago 12, Ill.

For More Details Circle No. 433—Page 45

Recording Scales

Four-page folder, Form 2023, describes advantages and uses of Printweigh scales.—**Toledo Scale**, division of Toledo Scale Corp., Toledo 12, Ohio.

For More Details Circle No. 434—Page 45

Platform Trucks

Powered platform trucks are described in Form F-10-2, "Job Applications for The Prime-Mover Model F-10." Material handling and service work are described in detail.—**Prime-Mover Co.**, Muscatine, Iowa.

For More Details Circle No. 435—Page 45

Electric Motors

Information about electric motors is contained in the 16-page "Motor Application Guide," Bulletin 270B.—**Century Electric Co.**, 1806 Pine St., St. Louis 3, Mo.

For More Details Circle No. 436—Page 45

Impact Testers

Brochure 561 and a data sheet describe and illustrate a motorized impact tester for metals.—**Testing Machines Inc.**, 72 Jericho Turnpike, Mineola, N. Y.

For More Details Circle No. 437—Page 45

Electric Hoists

Features of Hevi-Lift and Zip-Lift electric hoists are described in Bulletins H-55, H-62. Illustrations and specifications are given.—**Harnischfeger Corp.**, 4400 W. National Ave., Milwaukee 46, Wis.

For More Details Circle No. 438—Page 45

Boosters

Descriptions, illustrations, and technical data on Series C interchangeable air-hydraulic boosters are presented in Catalog 116.—**SP Mfg. Corp.**, 30201 Aurora Rd., Cleveland 39, Ohio.

For More Details Circle No. 439—Page 45

Dust Collectors

Series 345 dust collector line is featured in Bulletin 1928. Design and construction principles are discussed.—**American-Standard Industrial Div.**, Detroit 32, Mich.

For More Details Circle No. 440—Page 45

Thermal Insulation

Booklet is a guide to economical use of thermal insulating materials. "Re-thinking Thermal Insulation" contains a worksheet on economical thickness plus an index to ASTM and government specifications.—**National Insulation Manufacturers Association**, 441 Lexington Ave., New York 17, N. Y.

For More Details Circle No. 441—Page 45

SEE NEXT PAGE

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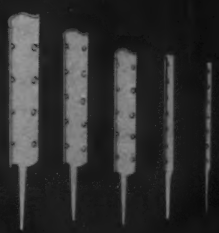

5 STANDARD SIZES

The ideal chill for a wide range of applications. A size for every need — eliminates makeshift chilling.

Circle 643 on Page 45

How To Prepare an Economic Study on

HEAT PROCESSING FURNACES

By BERNT A. RUEDIGER
Industrial Heating Department
General Electric Co.
Shelbyville, Ind.

● A FURNACE is an investment. It must make money or no one can afford to buy it. An existing furnace must make money or no one can afford to keep it. Therefore, it is necessary to know costs to make a decision on:

1. Whether the purchaser does his own heat treating or buys the service.

2. Whether to replace an existing equipment with a new furnace.

What costs must be known? For both the "make or buy" and "keep or replace" decisions, capital investment and operating expense must be known.

What are capital investment and operating expense? Generally speaking, capital investment includes the cost of facilities, equipment, and components that have a useful life in excess of one year. There are exceptions, however, so check company policy. In this discussion operating expense includes all the expenses of operating the furnace in addition to overhead items such as taxes, interest, depreciation, etc.

How precise must these costs be for economic studies? For both the "make or buy" and the "keep or replace" decisions a reliable estimate will suffice. It is more important to maintain the correct ratio for the respective costs rather than determining absolute dollars.

What cost items can be eliminated from the study? In economic studies all cost items that are the same for both processing methods can be eliminated. For example, supervision requirements are usually identical for both an old or new furnace and thus may be excluded from a comparison study. Therefore, it is most important to evaluate carefully each cost item to determine if it must be included in the cost analysis. The factors which must be considered for economic studies on furnaces are shown in Table I.

Where To Obtain Data—Equipment costs should come from the equipment manufacturer. Installation costs depend primarily on what must be done to make the furnace function. Trends today are toward the manufacture of complete furnaces that require only power, fuel, and water connections at one location on the furnace.

The purchaser need no longer weld, brick, pipe and wire except in the case of very large furnaces or other special cases.

Specifications should be checked carefully to determine what type of installation is necessary. A general figure should not be estimated because even similar furnaces from two suppliers may necessitate vastly different installation costs.

Existing records should provide some of the data needed for calculating operating expense, although

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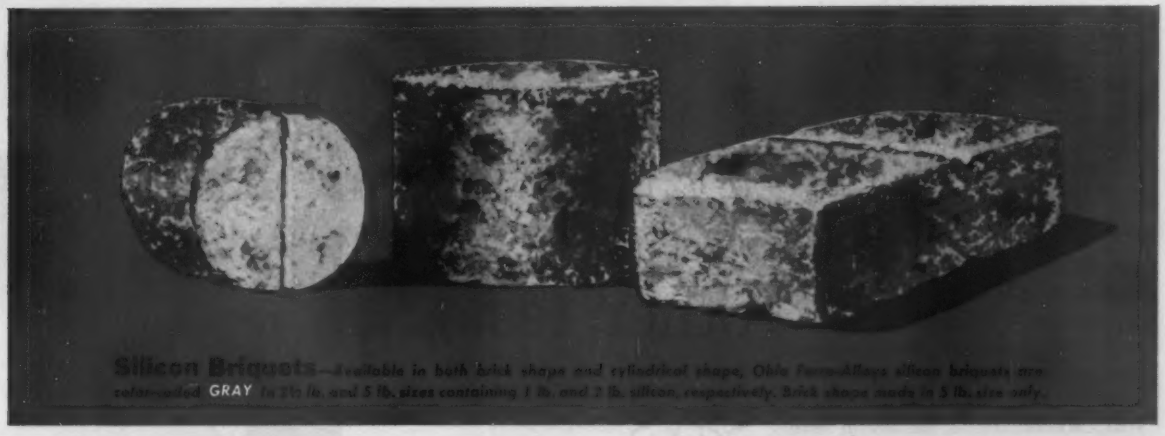
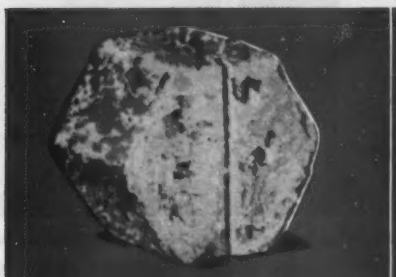
Shape Combined with Color Provides Positive Alloy Identification!

Ohio Ferro-Alloys has long followed the practice of color coding its briqueted alloys to provide swift, sure identification. Now . . . these briqueted Ohio Ferro alloys are also coded by shape to give you positive identification. Workers understand color and shape . . . you save time both in giving instructions and in avoiding errors caused by confusion. Only Ohio Ferro-Alloys brings you briqueted alloys with the twin advantages of color coding and coding by shape. And Ohio Ferro-Alloys briquets are notched without extra cost.

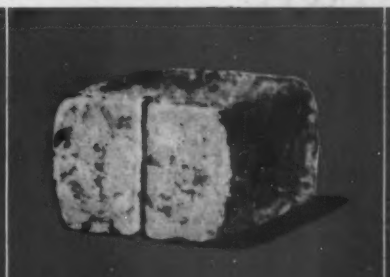


Silicon Briquets—Available in both brick shape and cylindrical shape, Ohio Ferro-Alloys silicon briquets are color-coded GRAY in 5½ lb. and 5 lb. sizes containing 1 lb. and 2 lb. silicon, respectively. Brick shape made in 5 lb. size only.



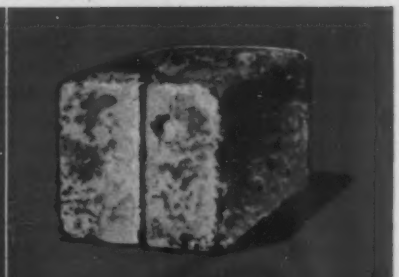
Chromium Briquets

Color-coded GREEN Ohio Ferro-Alloys chromium briquets are hexagonal in shape. 3½ lb. size contains 2 lb. chromium.



Manganese Briquets

Ohio Ferro-Alloys manganese briquets are oblong in shape and color-coded RED 3 lb. size contains 2 lb. manganese.



Silicomanganese Briquets

Square in shape, Ohio Ferro-Alloys silicomanganese briquets are color-coded YELLOW 3½ lb. size contains 2 lb. manganese, 1½ lb. silicon.

New Literature!

To help show you the most efficient and economical way to use briqueted alloys, Ohio Ferro-Alloys now has available new literature. On request, your copy will be sent promptly.

QUALITY DEPENDABILITY SERVICE

Ohio Ferro-Alloys Corporation
Canton, Ohio

Birmingham Boston Chicago Denver Detroit Houston Kansas City Los Angeles Minneapolis
Philadelphia Pittsburgh Salt Lake City St. Louis San Francisco Seattle Vancouver, B.C.

it must be determined whether the available data are applicable to the case under consideration. In general, a major portion of the expense data must be obtained from equipment manufacturer, fuel supplier, utility company, or equivalent sources.

How many years should the economic study cover? A good rule of thumb is five years. Short term studies of one or two years may be applicable. If depreciation is to be included, however, longer term studies are necessary. Depreciation rates, unless calculated for each year, should be a minimum five year average.

TABLE I—Items to Consider in Economic Studies

	—Type of Study— Make or Buy	Replace or Keep
Capital Investment		
Building	—	—
Furnaces	X	X
Installation of furnaces	X	X
Auxiliary equipment	X	—
Installation of auxiliary equip.	X	—
Operating Expense		
Material (basic)	X	—
Scrap savings (material and labor)	—	X
Power, fuel, water (fce. equipt.)	X	X
Direct labor (fce. operators & maint.)	X	X
Maintenance material costs	X	X
Supervision	—	—
Interest on loans	X	X
Taxes	—	—
Depreciation	X	X

X are those items that must be included in any study. The remainder frequently can be omitted. Which to keep and which to exclude, however, must be evaluated for each particular study.

How To Make the Study—The procedure is quite simple. The format may vary somewhat from company to company, depending on particular tastes, but for all practical purposes it consists of these three steps:

1. Obtaining the necessary basic information from the equipment manufacturer, utility company, and your own records.

2. Calculating the appropriate costs such as energy, water, atmosphere, maintenance material, maintenance labor, operating labor, depreciation, and interest on investment.

3. Summarizing the results. General Electric Co. uses standardized printed forms which are available. Other equipment manufacturers may also have such forms available.

Can this method be used for all types of furnaces? Economic studies can be made for all types of furnaces and all sources of heat. For economic studies furnaces are classified as two basic types—those that

"Can't make these molds with any other resin," says foundry president

MUCH FASTER THAN PLASTER. In place of conventional plaster for vaned aluminum parts, foundrymen at Harris employ shell molds using Durez resin. They get molds in minutes instead of days.

Look at the vanes in this fluid-coupling part and you'll see why it is a tough one to cast in aluminum.

"Only one shell-mold resin—a Durez resin—gives us satisfactory release in this application," says George Harris, president of Harris Metals Treating Co., Racine, Wisconsin.

From days to minutes. In the vanes is where tolerances are smallest. This type of casting is generally made in plaster—a time-consuming operation.

To hold cost down, Harris foundrymen decided right from the start to use shell molds. Result: they're making molds in minutes instead of days—with accuracy and finish right up to par.

Why shell is good insurance. Customers like the savings they make on machining—with the smooth,

FOUNDRY WHIPS RELEASE PROBLEM. On these vaned aluminum castings, Harris Metals Treating Co. gets good results with a Durez shell-mold resin—the only one that works.

accurate castings that shell molding and coring make possible. Foundries everywhere are finding shell a powerful advantage in getting and holding business against competitive bids.

Why you're ahead with Durez. Every year more foundrymen discover they get more of the advantages of shell molds and shell cores—and *fewer* of the problems—with Durez foundry resins.

You can count on these resins to give you results that don't vary: constant melt point, fast cure, freedom from peel-back; molds and cores of uniformly high tensile strength. That's because Durez resins are made by modern mass-production methods under the watchful eyes of men who have been making resins as long as 30 years.

You're ahead with Durez technical service, too. It's shirt-sleeve service—by men who know how to get the most out of resins where it counts, in your foundry.

To get his experience working for *you*, call in your Durez sales engineer soon.

How-to-do-it information. Regardless of which foundry resins you're using or plan to use, you'll find the new 32-page *Durez Guide to Shell Molding* helpful. Completely revised, it contains recommendations on patterns, materials, mixing, temperatures, lubricants, molds, cores. It's by men who have spent years learning the subject. Write for your copy today.

DUREZ PLASTICS DIVISION

1008 WALCK ROAD, NORTH TONAWANDA, N. Y.

HOOKER CHEMICAL CORPORATION

HOOKER CHEMICALS PLASTICS

Circle 645 on Page 45

are maintained at constant temperture and those that are alternately heated and cooled with the work. In making an economic study, it is only necessary to complete those portions of the forms that apply to the particular study. For example, it is unnecessary to obtain costs for all types of atmospheres if hydrogen is to be used.

On complex furnaces which have separate burn-off, preheat, blueing or cooling chambers, it is preferable to treat these components as independent equipments in the cost analysis. For cyclic temperature furnaces which are operated under intermediate conditions such as where the heating chamber is only partially cooled, it is preferable to have the furnace manufacturer prepare the economic study.

How to summarize? General practice is to combine the individual costs in measurement items as follows: 1. Total capital investment. 2. Annual operating expense. 3. Product processing cost per pound. 4. Annual savings. 5. Return on investment. 6. Capital investment differential. 7. Operating cost differential. 8. Time to return investment.

The first two are old friends. Product processing cost per pound simply means how much it costs to process the product through the furnace on a per-pound base, or, if desirable, on a per-part base. Annual savings represents the cost reduction anticipated by use of the new equipment. Return on investment is the profit made on the investment. It is usually reported in per cent rather than actual dollars.

To illustrate what an economic study can do, let us consider a few typical examples. In each case the economic study was made using the basic information form, cost analysis form, and economic summary form.

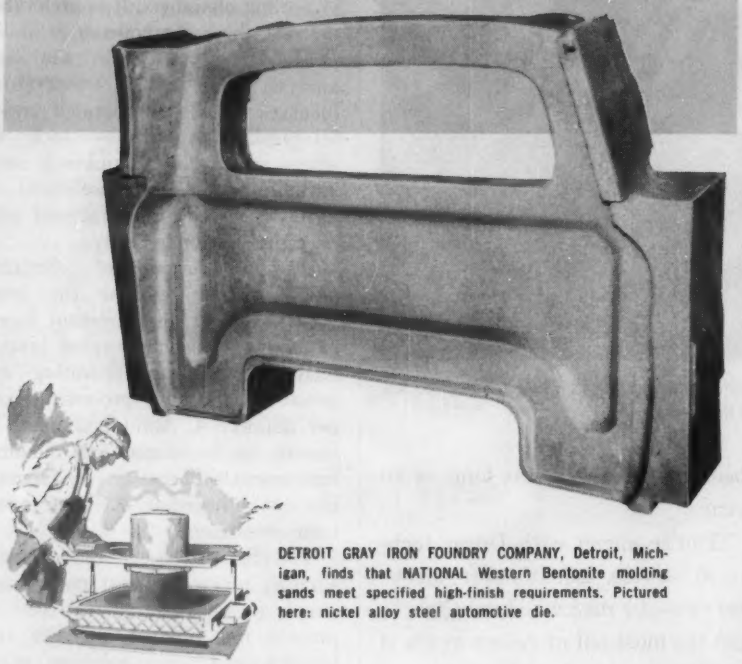
Case 1—The ABC Malleable Iron Co. has obtained a proposal and specifications on both a pusher and roller hearth continuous furnace for annealing ferritic iron. The question is which to purchase. After an economic study, the following data were determined and recorded on the summary form:

Item	Pusher Furnace	Roller Hearth Furnace
Total Capital Investment		
Building and facilities	.....	.....
Fce. and installation	$175,000	$191,000
Baskets and trays	26,800	19,900

for high-finish requirements

NATIONAL*

Western Bentonite



DETROIT GRAY IRON FOUNDRY COMPANY, Detroit, Michigan, finds that NATIONAL Western Bentonite molding sands meet specified high-finish requirements. Pictured here: nickel alloy steel automotive die.

Detroit Gray Iron Foundry Company, Detroit, Michigan, uses NATIONAL Western Bentonite as the sand-bonding agent for a wide variety of castings. Detroit has found that the results are rewarding . . . smoother surfaces, closer tolerances, more faithful reproduction of patterns.

NATIONAL Western Bentonite in molding sands produces fine finish castings of all metals — malleable iron, gray iron, steel, brass, aluminum or magnesium.

For good molding, better cores and high-refractory core wash formations, use NATIONAL Western Bentonite. NATIONAL cores dry faster, have higher dry strength and contain less gas.

NATIONAL Western Bentonite is available from foundry dealers everywhere. See opposite page for list of dealers.

BAROID

BAROID CHEMICALS, INC.

*Registered Trademark, National Lead Company

6072

Auxiliary equipment and installation	.....	.....
	$201,800	$210,900
Annual Operating Expense		
Energy	12,250	12,250
Baskets & trays replacement	7,350	4,200
Fce. material maintenance.	1,260	1,390
Fce. maintenance labor ..	2,100	2,100
Fce. operator labor	13,900	12,600
Depreciation (10-yr period)	20,180	21,090
Interest (assumed)	4,040	4,220
	$61,080	$57,850

Capital investment differential = $9,100 favoring pusher furnace
Operating expense differential = $3,230 per year favoring roller hearth furnace

Time to equalize the investment differential by operating cost savings = 2.82 years. This example illustrates a very significant point. Selection of equipment should not be based on capital investment alone. If the ABC company had purchased the pusher furnace, the economic loss in the first ten years would have been $23,200.

Case 2—The EZY Casting Co. is using a number of obsolete annealing furnaces which it would like to replace. A proposal and specifications were obtained from several equipment manufacturers. Since the capital investment will require the company to borrow considerable money, the question arises whether the proposed purchase is economically sound.

A summation of the economic study that was made showed the following:

	Old Method	New Method
Capital Investment		
Fce. complete with installation		$200,000
Trays and work containers..		20,000
		$220,000
Operating Expense		
Energy cost	$19,100	$ 7,700
Container replacement	20,900	4,500
Fce. material maintenance ..	4,500	4,200
Maintenance labor	3,200	2,900
Operating labor	33,300	13,500
Depreciation (10% per yr)..		22,000
Interest on investment		6,600
	$81,000	$ 61,400

Capital investment differential = $220,000
Operating expense differential = $ 19,600
Return on investment = 8.9%
Time to return investment = 11.2 years

This example illustrates that the EZY Casting Co. could not economically justify the purchase of new equipment. If the company has a product quality problem with the old equipment or if the obsolete equipment has only a limited remaining useful life, the decision based on economics must be tempered appropriately.

Case 3—The XYZ Malleable Iron Co. couldn't decide whether to install an electric or gas heated batch furnace. The old industrial rule of thumb says that gas fired equipment may cost a little more initially but it's a lot cheaper to operate. Again an economic study was prepared. Findings were as follows:

Item	Electric Batch	Gas Batch
Total Capital Investment		
Building and facilities	.....	.....
Fce. and installation	$230,000	$250,000
Baskets and trays	35,000	35,000
Auxiliary equipment and installation	.....	.....
	$265,000	$285,000
Annual Operating Expense		
Energy	10,800	6,550
Basket and tray replacement	2,250	2,250
Fce. material maintenance .	5,100	6,900
Fce. maintenance labor ...	900	1,050
Fce. operator labor	7,200	7,200
Depreciation (10-yr period) .	26,500	28,500
Interest (assumed)	5,300	5,700
	$58,050	$58,150

Capital investment differential = $20,000 favoring the electric heated furnace. Operating expense differential = $100 per year favoring the electric heated furnace.

Again a direct evaluation of tangible costs has shown the "supposed" obvious to be incorrect. This example, although it illustrates that there may be a disadvantage in using the cheaper fuel, is not intended to infer that this will always be the case. Under certain conditions the opposite may be true.

What should you do before buying equipment? Base your decision on as many facts as possible. Make an economic study to tie down the tangibles. Don't use rules of thumb. Don't use only capital investment or operating expense to reach a decision but use both.

If tangibles leave you in doubt, put a dollar value on intangibles. A good estimate is better than no estimate. Make an economic study. Cost data are available from your records, those of the equipment manufacturer, and your technical or professional society. You can't afford to lose money, especially when it's your own.

Book Review

Modern Safety Practices, by Russell DeReamer, cloth, 357 pages. Published by John Wiley & Sons Inc., 440 Fourth Ave., New York 16, N. Y. Price $7.

This book provides a practical guide to the latest methods of safety organization and administration. It is directed toward motivating managers and supervisors to a more active role in accident prevention.

Comprehensive coverage of newly developed and tested safety methods is presented in four phases: Development of safe working conditions; job hazard analysis and personalized safety training; promotion of employee safety participation; and the enforcement of safety rules. The appendix includes an outline for a complete safety program.

closer tolerances with

NATIONAL* Western Bentonite

DETROIT GRAY IRON FOUNDRY COMPANY, Detroit, Michigan, cast this 23,200 pound nickel alloy steel automotive die using NATIONAL Western Bentonite. Note the close tolerances and deep draw of this high-finish casting.

*Registered Trademark, National Lead Company

These dealers stock NATIONAL Western Bentonite

American Steel and Supply Company, Chicago, Illinois
Asbury Graphite Mills, Inc. Asbury, New Jersey
Asher-Moore Company, Richmond, Virginia
Brandt Equipment and Supply Company, Houston, Texas
George W. Bryant Core Sands, Inc., McConnellsville, New York
The Buckeye Products Company, Cincinnati, Ohio
Canadian Foundry Supplies & Equipment Ltd., Montreal 30, Quebec (Main Office)
Canadian Foundry Supplies & Equipment Ltd., Toronto 14, Ontario
Combined Supply & Equipment Company, Buffalo, New York
Foundries Materials Company, Coldwater, Michigan
Foundries Materials Company, Detroit, Michigan
Foundry Service Company, Birmingham, Alabama
General Refractories Company, Indianapolis, Indiana
The Hoffman Foundry Supply Co., Cleveland, Ohio
Independent Foundry Supply Company, Los Angeles, California
Industrial & Foundry Supply Company, Oakland, California
Interstate Supply and Equipment Co., Milwaukee, Wisconsin
Klein-Farris Company, Inc., Boston, Massachusetts
La Grande Industrial Supply Co., Portland, Oregon
Marthens Company, Moline, Illinois
Carl F. Miller and Company, Inc., Seattle, Washington
John P. Moninger, Elwood Park, Illinois
Pennsylvanian Foundry Supply & Sand Co., Philadelphia, Pennsylvania
Robbins and Bohr, Chattanooga, Tennessee
Smith-Sharpe Company, Minneapolis, Minnesota
Steelman Sales Company Munster, Indiana
Warner R. Thompson Company, Detroit, Michigan
Western Materials Company, Chicago, Illinois
Walter A. Zeis, Webster Groves, Missouri

Write today for BOOKLET giving further information on the benefits gained from using NATIONAL Western Bentonite

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6073

BAROID CHEMICALS, INC.
A SUBSIDIARY OF NATIONAL LEAD COMPANY
1809 SOUTH COAST LIFE BLDG., HOUSTON 2, TEXAS

Circle 647 on Page 45

News Views

AWARDS: Flick-Reedy Corp., Bensenville, Ill., recently enjoyed the distinction of receiving two of the major awards available to industry. The American Public Relations Association presented the company its Silver Anvil for outstanding work in the field of public relations among manufacturers. Shown, left to right, are S. G. House, co-chairman of Silver Anvil awards, and H. W. Cloke, president, APRA, making the award to Frank Flick, Flick-Reedy Corp. The other honor won by the company was a Factory citation naming its plant as one of the top ten built in 1959

FEF FELLOWSHIP: Robert G. Liptai is presented the certificate for the Foundry Educational Foundation Wheelabrator Fellowship which he held for the 1959-60 school year. He received his M. S. degree in mechanical engineering from the Missouri School of Mines at Rolla, Mo., on May 29. Shown here, left to right, are Prof. R. V. Wolf, Dean Curtis L. Wilson, Mr. Liptai, and Prof. D. S. Eppelsheimer

SFSA CONFERENCE: Steel Founders' Society recently held a joint conference in San Francisco, conducted by Northwest and Southwest Division VIII. The reginal meeting was attended by three guests and 58 members representing 22 foundries. Shown here, third and fourth from left, are two guests of the conference, D. L. Hall, Oklahoma Steel Castings Co., Tulsa, Okla., and V. E. Zang, Unitcast Corp., Toledo, Ohio. Others, left to right, are Phillip McCaffery, General Metals Corp., Oakland, Calif.; Herb Gould, Washington Iron Works, Seattle, Wash.; Eugene B. Nutter, Alloy Steel & Metals Co., San Bernardino, Calif.; Osman E. Erickson, Hanford Foundry Co.; and Nino V. Davi, Pacific Steel Casting Co., Berkeley Calif., all of whom were conference committee members

A Significant NEW

NO-BAKE Binder

→ For Production and Semi-Production

→ For Cores and Molds in Iron, Steel and Non-Ferrous Casting

NO ODOR • COMPLETE COLLAPSIBILITY • MAKE AND DRAW CORE BOXES—While new to this country, *CECO-SET* is thoroughly proved effective in actual foundry practice. Remarkable economies, together with improved casting quality are achieved through use of *CECO-SET*. Minimum hand ramming is required, a long sand life is assured, there is less gas in the core—with no obnoxious smoke during pouring.

Ask for Bulletin CS-1 on CECO-SET No-Bake Binder.

Circle 648 on Page 45

PRODUCTS FOR FOUNDRY PROGRESS

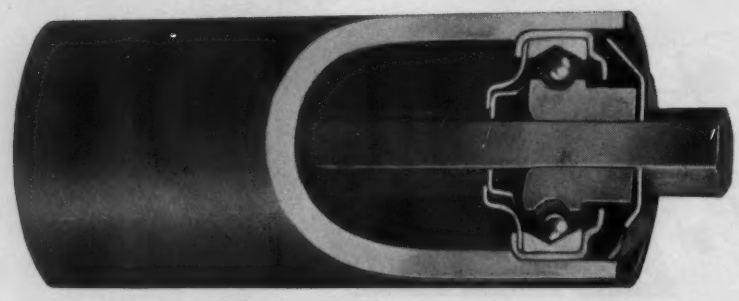
G. E. SMITH, INC.

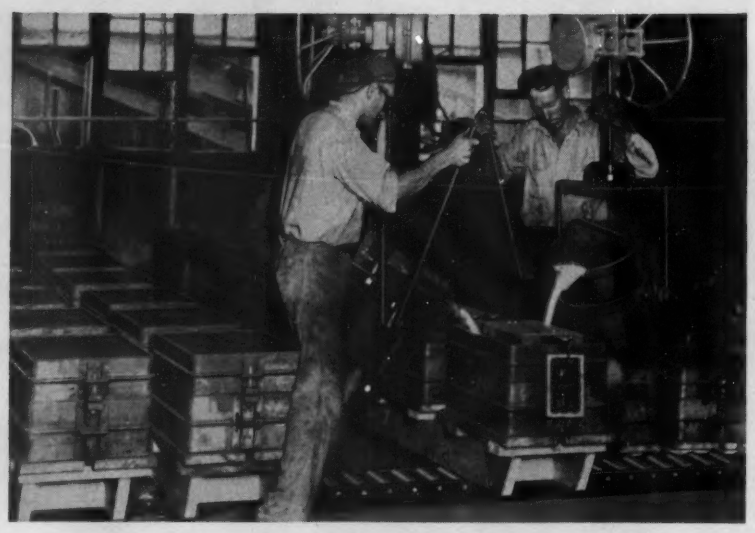
246 Washington Road Pittsburgh 16, Pa.

Distributors: Core-Lube, Inc., Danville, Ill. • Klein-Farris Co., Inc., Boston, Mass. • Sierra Foundry & Supply Co., San Gabriel, Calif. • George F. Pettinos (Canada) Limited, Hamilton, Ontario

STANDARD'S SHIELDED BEARINGS

Grease-packed against dirt and corrosion— Ideal for Foundry Conveyor Service





Move molds faster with less vibration and metal spillage on Standard roller conveyors — equipped with Standard's shielded, grease-packed bearings, protected against sand, dirt, and metal damage.

Standard's bearings are specially engineered for heavy duty foundry service . . . protective shielding keeps dirt from entering bearing. They are grease-packed at the factory for added protection and minimum maintenance. Provision made for regreasing to flush bearings.

Standard has been designing and manufacturing foundry conveyors since 1906 — a good reason why you can depend on Standard equipment to move foundry tonnage faster, safer, more profitably.

STANDARD CONVEYOR COMPANY
General Office: N. St. Paul 9, Minn.
Sales and Service in Principal Cities

Send for Standard's new, fully illustrated catalog, "Standard Conveyors Engineered for Faster Production" — a valuable reference book describing the many applications of Standard Conveyors for diversified industry. Address Dept. N-8.

Standard
GRAVITY & POWER
CONVEYORS

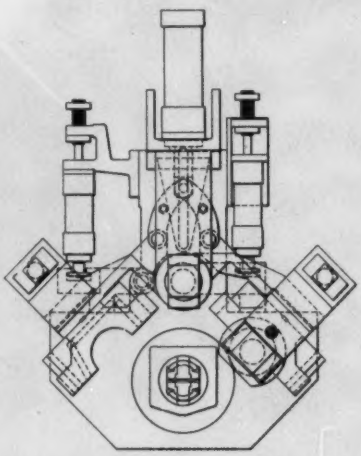
OVER 50 YEARS OF CONVEYOR EXPERIENCE

PATENTS

Of Interest to Foundrymen

Uses Metal Mold

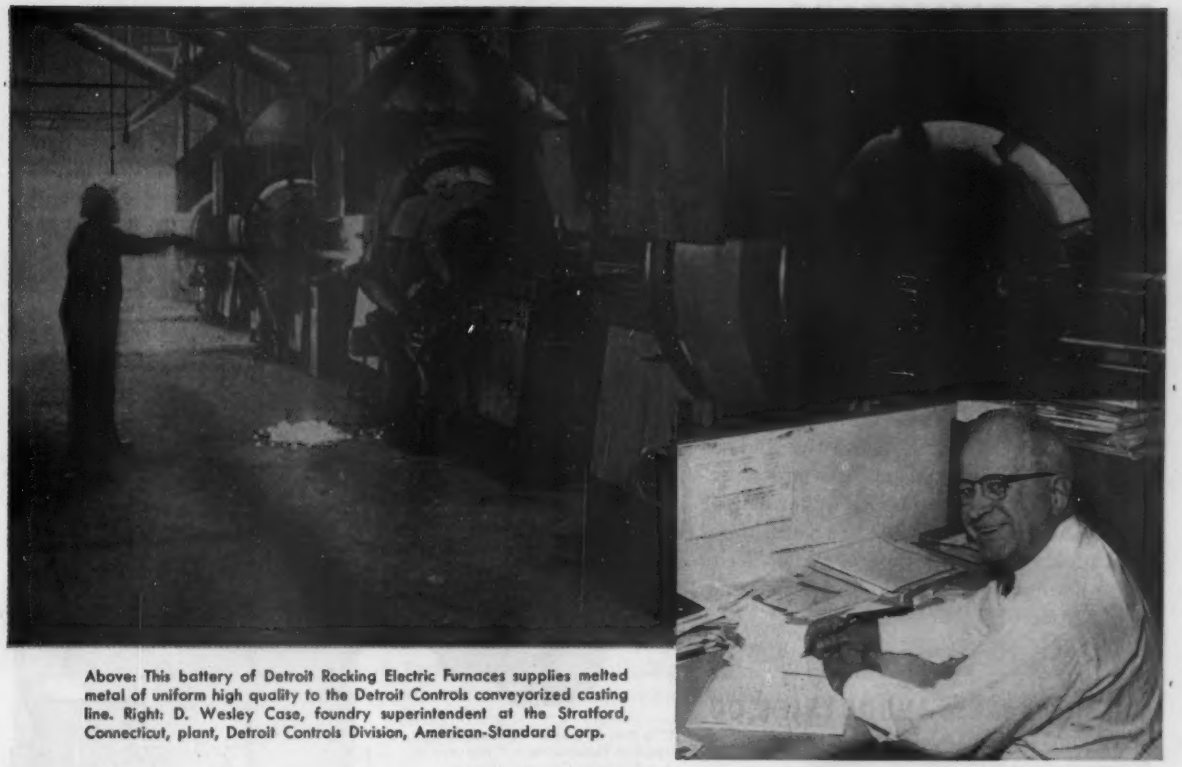
Permanent mold machine for production of pistons has the exterior mold halves hinged for opening and closing like a book. The halves engage guiding surfaces on the base ring to move them into position with great accuracy. The underside of the base ring carries guide surfaces which form slideways for co-operating flat surfaces formed on the base of the side cores. In this manner all of the main moving parts of the mold are guided into their final positions by engagment with straight surfaces of the stationary base ring.



Since the flat surfaces can be machined to close tolerances, it is claimed that the moving parts can be positioned with a high degree of accuracy. *Patent* 2,939,190 *granted to M. H. Jones and John Peters and assigned to Bohn Aluminum & Brass Corp.*

Tumbling Mill

Pertains to a continuous feed tumbling apparatus to handle a stream of work pieces with loose recycled treating material. Includes a horizontally rotating drum with a separator means projecting outwardly from one end opposite the charging end. A discharge means connects the tumbling drum and the



Above: This battery of Detroit Rocking Electric Furnaces supplies melted metal of uniform high quality to the Detroit Controls conveyorized casting line. Right: D. Wesley Case, foundry superintendent at the Stratford, Connecticut, plant, Detroit Controls Division, American-Standard Corp.

"Once the controls are set, Detroit Electric Furnaces automatically regulate for the most efficient performance."

Here's a new plant, planned and equipped for production line efficiency in the manufacture of brass and bronze valves and specialties. And to furnish melted metal of highest quality at speeds to match the efficiency of the rest of the plant, Detroit Controls Division of American-Standard Corporation chose Detroit Rocking Electric Furnaces.

"These furnaces," says D. Wesley Case, foundry superintendent, "practically eliminate the human element, with its possible errors, from the metal-melting process. Once the controls are set, the furnaces themselves regulate the degree of rocking and maintain the proper arc for the most efficient performance."

Fast, economical melts of uniform high quality and exact analysis are produced by Detroit Rocking Electric Furnaces in hundreds of foundries across the country. There's a size and type that's right for you, too. Find out now!

DETROIT ELECTRIC FURNACE DIVISION

Kuhlman Electric Company • Bay City, Michigan

Foreign Representatives: in BRAZIL—Equipamentos Industrias, "Elsa" Ltd., San Paulo; CHILE, ARGENTINA, PERU and VENEZUELA: M. Castellvi Inc., 150 Broadway, New York 38, N. Y.; MEXICO: Cia Proveedora de Industrias, S.A. Apartado Postal No. 2783, Mexico 7, D.F., Mexico.

Furnace being loaded with 750 lbs. of bronze-based ingots. Only two men operate the battery of furnaces.

45 minutes from 750 lbs. of ingots to 750 lbs. of metal ready for the molds.

A mechanized line like this needs a constant supply of metal. And Detroit Electrics keep the ladles full.

Circle 650 on Page 45

SUPER TAMASTONE INCREASED PRODUCTION ON THIS JOB 400%...CONVERTS LOOSE AND SHORT RUN JOBS INTO LOW COST MASS PRODUCTION, WITHOUT SKILLED LABOR!

Modern foundries count on Super Tamastone to increase production; solve nuisance jobs; speed up short runs; and cut labor costs! Tamastone patterns are so accurate they actually stand up under caliper tests! And, you can get up to several thousand molds from this type of plate. Write for full information, including prices and specifications.

Tamms INDUSTRIES CO.
228 North La Salle Street
Chicago 1, Illinois

12½ lbs. of Super Tamastone was used in this pattern. Courtesy of A-1 Foundry, Chicago, Illinois

WHERE YOUR BUSINESS IS APPRECIATED!

Circle 651 on Page 45

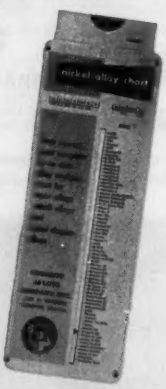
Pre-Alloyed Furnace Charges
at a cost less than the price of their original components!

Quality Controlled Stainless and Nickel-Cobalt Alloys in Briquettes, Cut Plates, Stampings and other forms

● These Pre-Alloyed Furnace Charges from Security Alloys, pioneer processors of alloyed nickel, will help reduce your melting time because of their high density and uniform analysis. Tailor-made to most commercial and military specifications, requiring fewer foundry additives and permitting easier prediction of casting analysis.

Color-coded and packaged to your requirements at no extra cost.

For more information on how our Pre-Alloyed Furnace Charges can save you time and money, *write to Foundry Division, Security Alloys Company, Incorporated, 3106 West 49th Place, Chicago 32, Illinois or phone PRospect 6-8500.*



SEND FOR FREE POCKET-SIZE ALLOY SLIDE CHART
Complete analysis of over 100 nickel-cobalt alloys

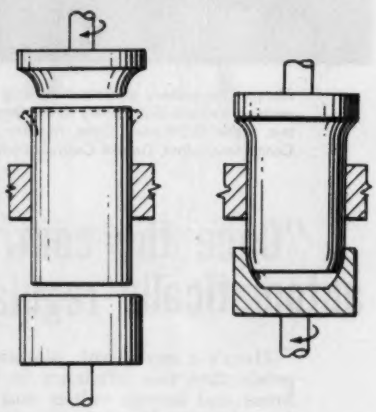
FOUNDRY DIVISION

SECURITY ALLOYS CO. INC

separator to transfer the work and treating material from one to the other. Separator screens remove treating material from the work while advancing latter toward the discharge opening. A return device advances screened treating material toward the charging end of the tumbling drum where it is recycled with incoming work. *Patent No. 2,933,861 granted to R. R. Bintzler and assigned to Ransohoff Co.*

Tube for Core Blower

Cold-forming of nylon or nylon-like tubes into predetermined geometrical shapes to fit holes in the blowplates of coremaking machines is described. Procedure is to clamp a suitable length of thin-walled nylon tubing in a jig and bring it down



on the top of a rotating tool of the proper contour to expand it into the desired form. Thereafter, or at the same time, a cup-shaped tool is brought up against the bottom of the tube to form a restricted opening. Friction of the tools rotating at about 1750 rpm is sufficient to result in cold flow of the nylon into the proper form. *Patent No. 2,933,-786 granted to E. F. Peterson.*

Shell Mold Material

Sticking of molds to the patterns in the shell molding process is claimed to be prevented by use of a self-lubricating molding material. That material, in addition to the usual resin sand combination, contains 0.1 to 0.5 per cent carnauba wax by weight. When added to the sand, the wax is dissolved in dibutyl phthalate in the ratio by weight of 10 to 25 per cent carnauba wax and 90 to 75 per cent dibutyl phthalate at a temperature of 190° F

Circle 652 on Page 45

In Milwaukee, The Vilter Manufacturing Company uses...

3/4 inch of BERLITE to line 2600 lb. ladles

BERLITE-lined 2600 pound ladle

IRONTON BERLITE

is "insurance" for the Vilter foundry where VILTRITE castings have to be right the FIRST TIME. The superintendent there specifies BERLITE for lining ladles because his long experience shows consistently...absolutely

- NO EROSION
- FORMS NO SLAG
- NO METAL STICKS TO BERLITE LINING

(any shell that forms in ladle is easily knocked out without harm to the lining)

All the facts on this BERLITE application are available from Ironton. If you want to test Ironton BERLITE in a ladle, let us know. We will show you what a RELIABLE REFRACTORY can do!

SINCE 1917 THE IRONTON FIRE BRICK COMPANY IRONTON, OHIO

1335 Ashtabula Street

Write or call Ironton collect for name of nearest representative.

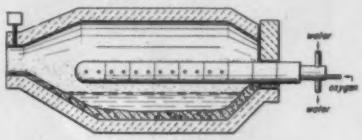
Circle 653 on Page 45

or above. Other aromatic esters such as dialkyl phthalates and tricresyl phosphate may be used.

For addition to dry sand mixtures, the hot wax-phthalate solution is mulled with the sand for 7 to 8 minutes and then the powdered resin binder is added with further mulling for 8 minutes. With resin coated sand the hot wax phthalate is added directly to the sand with only one mulling period. *Patent No. 2,923,989 granted to R. F. Thomson and assigned to General Motors Corp.*

Steelmaking Furnace

Improved Bessemer type unit for steelmaking consists of a cylindrical vessel having tapered ends and its axis positioned horizontally. Means are provided to tilt it in either direction as well as to rock the vessel on its horizontal axis in an arc up to 45 degrees. The unit also includes a refractory-coated, water-cooled lance containing two oxygen inlet tubes spaced about 90 degrees apart



which emit oxygen through a series of jet openings spaced about 3 to 5 in.

It is claimed that the apparatus and method minimize heat losses and permit larger proportions of scrap in the charge, also that composition of resulting steel can be controlled closely. Dust emission is said to be much less than for other Bessemer processes and there is less erosion of refractory surfaces. *Patent No. 2,936,230 granted to B. M. Larsen and assigned to U. S. Steel Corp.*

Scaling Elimination

Prevention of scaling during cooling of cast metals, particularly in the investment molding process, is said to be accomplished by application of hexamethylene tetramine to the exposed surface of hot metal in the riser, and then enclosing the mold in a suitable container such as an open-ended drum to maintain about the mold the protective gaseous blanket generated. The gaseous blanket prevents decarburization of metal and interaction of

At Adell Foundry Co. in Wisconsin, Supt. Bintzler gets

6 months service from "SPLITS and BERLITE" ladle lining

Mr. Bintzler (hand on wheel) and helper with BERLITE-lined ladle.

EASY WORKING, EASY CLEANING

that's what foundrymen want in a lining for grey iron ladles. At Adell, they say nothing ever tried can equal

IRONTON BERLITE

The "Bintzler Sandwich" of BERLITE and brick may be the lining you need. All the details are in a service report that Ironton will send without obligation. Try BERLITE and see why so many foundrymen say it's the only lining they will use for bull and pouring ladles.

SINCE 1917 THE IRONTON FIRE BRICK COMPANY IRONTON, OHIO

1335 Ashtabula St.

Write or call Ironton collect for name of nearest representative.

Circle 654 on Page 45

Foseco®

EXOTHERMICS

- Get Yields Up To 90%
- Eliminate Piping & Shrinkage
- Reduce Riser Sizes

Foseco Exothermic Compounds have been especially developed to insure casting quality through better feeding. These *heat producing* and *insulating* compounds prevent premature freezing of metal in the riser—extend feeding time.

The result: Reduced scrap loss due to shrinkage . . . yields up to 90% of metal cast . . . permits smaller riser sizes.

Economical and easy to use, Foseco exothermics are compounded in grades for all metals and casting techniques.

4 TYPES

Feedex®

A moldable exothermic—generally used as a sleeve or cylinder—used to line risers in sand and ingot molds.

Feedol

An exothermic hot-topping compound for heating and insulating the surface of risers in all non-ferrous castings.

Ferrux

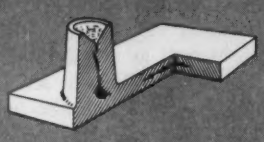
A heat producing compound for insulating and heating the risers of iron and steel castings.

Kalmex®

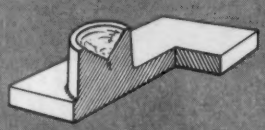
This Foseco exothermic—used for steel and iron castings—produces liquid metal which serves to increase the amount of available feed metal in the head. It produces high heat and provides an insulating slag.

Foseco Technical Service—
available to help you solve foundry problems.

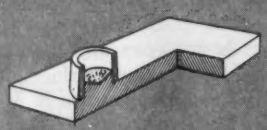
Foseco® Exothermics Insure Feeding Efficiency



INADEQUATE RISER
Without an exothermic, metal in inadequate conventional risers solidifies before filling cavity.



CONVENTIONAL RISER
With adequate conventional riser, feeding is satisfactory but increased size of riser requires excessive cleaning, wastes feed metal.



EXOTHERMIC RISER
Foseco exothermic riser is only one-fourth the volume of adequate conventional riser above. Metal stays molten in riser, feeds by atmospheric pressure, assuring sound castings with no piping or shrinkage.

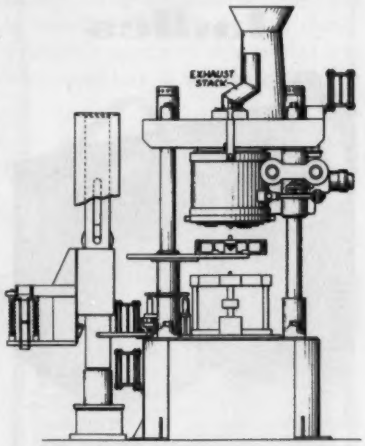
Foseco® T.M.
Foundry Services, Inc.
P. O. Box 8728 • Cleveland 35, Ohio
Phone: BEres 4-3551

A world-wide organization serving the chemical and metallurgical needs of the entire metal casting industry.

oxygen at the surface. *Patent No. 2,935,772 granted to Clifford Shaw and assigned to Shaw Process Development Corp.*

Molding System

Apparatus and system automatically blows and stacks sand cores and molds. Sand receptacle is positioned and clamped automatically to receive a charge of sand which is blown in from a sand charging mechanism. Sand then is squeezed or packed into the receptacle from below by a ram. After the ram is withdrawn, the receptacle is lowered

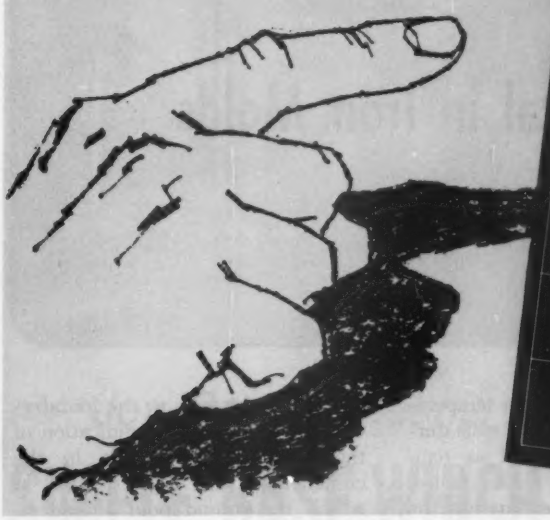


onto the turntable arms, which rotate it 120° out of the work area onto a stacking mechanism where the receptacle is removed from the arms. Suitable controls permit repetition of the cycle automatically any number of times. *Patent No. 2,937,420 granted to H. J. B. Herbruggen and assigned to Pettibone Mulliken Corp.*

Alloy Resists Acid

Nickel-base alloy containing a substantial amount of chromium and smaller amounts of other elements, including specific amounts of boron and silicon, is characterized by hardness and exceptional corrosion resistance to high concentration of sulfuric acid at elevated temperatures. The alloy contains 27 to 29 Cr, 8.5 to 9.0 Mo, 5 to 6 Cu, 4.5 to 6 Si, 0.025 to 0.20 B, 1 to 1.5 Mn, up to 2.0 Fe, up to 0.06 C, up to 0.10 Ti, and remainder Ni. *Patent No. 2,938,787 granted to W. K. Boyd, M. E. Langston and T. E. Johnson and assigned to Stainless Foundry & Engineering Co. Inc.*

Why you can't afford cheap nozzles...



BORE OF NOZZLE IN INCHES	CU. FT. OF AIR PER MINUTE @ 80 LBS. PER SQ. IN.	H.P. REQUIRED TO MAINTAIN PRESSURE
3/8	191	34.76
13/32	225	40.95
7/16	260	47.32
15/32	299	54.42
1/2	340	61.88
9/16	430	78.26
5/8	532	96.82

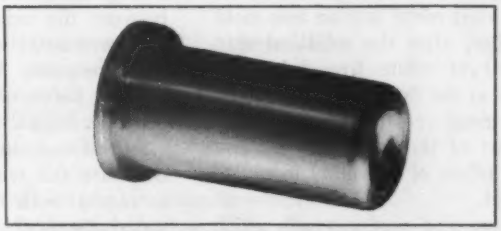
The chart tells the story.

Any pressure blast nozzle which wears rapidly greatly increases your compressed air bill. For example, when you start with a 3/8" bore nozzle at 80 lbs. blasting pressure, it will pass 191 cu. ft. of air per minute, requiring 34.76 H.P. However, when this nozzle has enlarged only 9/16" to 9/16" bore, you must supply 430 cu. ft. of air per minute to maintain the 80 lb. pressure. And you pay for 78.26 H.P. to develop this volume. And with ordinary nozzles, the difference between 3/8" and 9/16" occurs in only a few hours, or when manufactured abrasives are used, this can happen in a matter of minutes!

Now contrast the minimum guaranteed life of Norton NORBIDE* Pressure Blast Nozzles: 750 hours with silica sand . . . 1500 hours with steel shot or grit! Lined with light, tough Norton Boron Carbide — a compound exceeded in hardness only by the diamond — they maintain high-efficiency abrasive velocity *economically* throughout their life span.

Why blast away your profits with cheap nozzles? Get the most work out of both nozzle *and* air with NORBIDE Nozzles. Available with bores from 1/8" to 1/4"; lengths up to 6". For details write Norton Company, Refractories Division, 307 New Bond Street, Worcester 6, Mass.

*Trade-Mark Reg. U.S. Pat. Off. and Foreign Countries



NORBIDE Pressure Blast Nozzles cut air costs 10% to 20%.

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REFRACTORIES

Engineered... Rx ...Prescribed

Making better products . . . to make your products better

NORTON PRODUCTS: Abrasives • Grinding Wheels • Machine Tools • Refractories • Electro-Chemicals — **BEHR-MANNING DIVISION:** Coated Abrasives • Sharpening Stones • Pressure-Sensitive Tapes

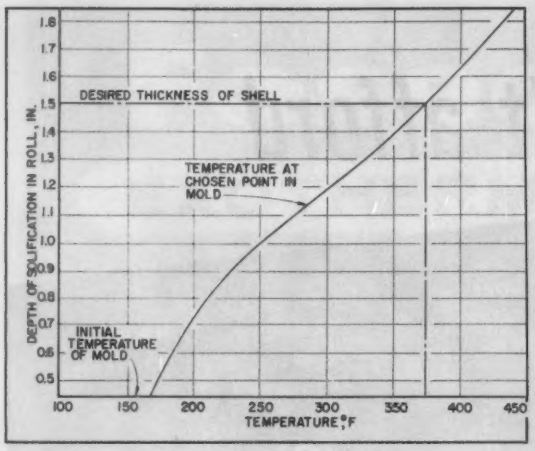

DESIRED THICKNESS OF SHELL
TEMPERATURE AT CHOSEN POINT IN MOLD
INITIAL TEMPERATURE OF MOLD
DEPTH OF SOLIDIFICATION IN ROLL, IN.
TEMPERATURE °F

Fig. 1—Curve shows temperature in chiller mold versus depth of solidification in roll casting

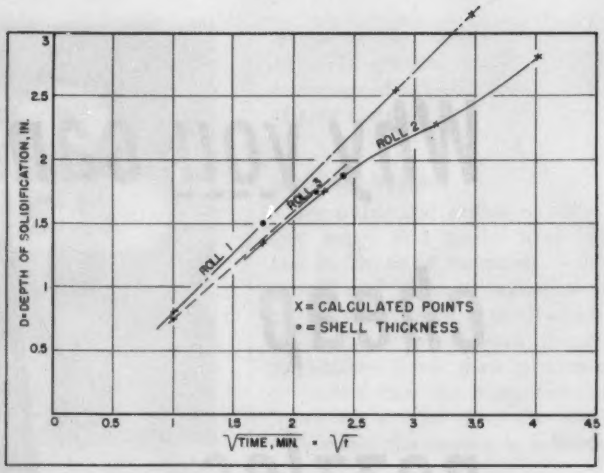


Fig. 2—Depth of solidification in roll casting versus the square root of time

Solidification of Metal in Iron Molds

By J. D. KELLER and N. R. ARANT
Associated Engineers, Pittsburgh
Roll Manufacturers Institute, Pittsburgh

● IN THE CASTING of double-poured iron rolls it is very important that the relation of depth of solidification to time be accurately known, so that the second pour can be started at exactly the right time to give the desired depth of white-iron shell.

This type of roll is made by first pouring a molten, alloyed (chrome-nickel-iron) metal into an iron mold or chiller; after the solidified skin or shell of white iron has been formed to the desired thickness, the liquid metal remaining in the central part of the roll is flushed out by an inflow of low-alloy iron into the mold.

This method produces rolls which have great hardness, compressive strength, and wear resistance in their outer part or shell, combined with greater toughness in the core and necks.

Temperature Measurements—The Roll Manufacturers Institute recently sponsored experimental work on the pouring of actual production rolls of alloy cast iron having 12, 18, and 22 in. nominal diameters; the purpose was to obtain temperature measurements in the rolls during solidification, as well as temperatures in the iron chiller molds.

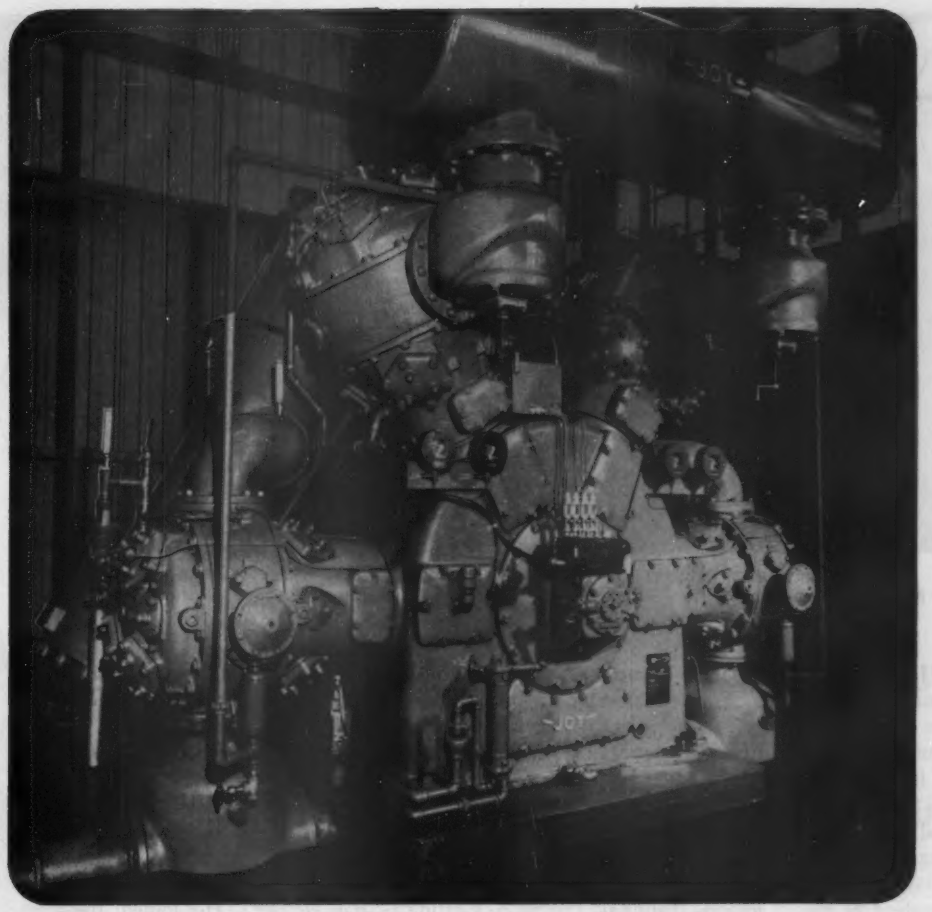
When it came to evaluating the results, however, great difficulty was encountered, because the locations of the thermocouple junctions were not exactly those desired, especially as regards closeness to the interface between the mold and the casting; and because in some cases as much as 5 minutes had elapsed after pouring before the temperature recordings began.

It was necessary therefore to extrapolate the temperature readings as regards both time and space (or radial distance), and to do this accurately an entirely new calculation method which would be applicable to the particular conditions of these tests had to be developed by one of the authors.

This was done successfully, and it led to the development of a curve, shown in Fig. 1, which relates the depth of solidification of the white iron to the measured temperature at a specified depth in the chiller mold. By this means, the foundryman can tell from the indication of the control thermocouple in the chiller mold, the exact instant at which the second pour should be started, in order to produce the desired thickness of hard shell in the roll.

The results also showed that the depth-time relation during solidification corresponds fairly well to an equation of the Chipman-Fondersmith type, as evidenced in Fig. 2, but with some deviation in the larger-diameter rolls. This deviation probably is due to the effect of double pouring.

The calculation methods and other features are described in greater detail in two papers by the present authors. The first, in *Blast Furnace & Steel Plant* for September 1958, pages 957-965, deals with the temperatures in the chiller mold and with the air gap; the second paper, in *Modern Castings*, February 1960, pages 71-80, deals with the temperatures in the casting itself, and also ties together the two parts of the investigation.



This 350 hp WN-224 Compressor supplies plant air to a modern foundry in Indiana.

Joy Design Means:

SIMPLE BASE WHICH CUTS COMPRESSOR INSTALLATION COSTS

The semi-radial design of Joy compressors makes installation a simple and inexpensive operation. Machines are completely assembled when shipped from the factory. Installation is accomplished by securing the frame to four studs set in the rectangular concrete pad. Form work is simpler, and the complicated alignment and assembly operations necessary with other compressors are eliminated. The net result is lower installation cost for your compressors.

Joy semi-radial compressors have many other features which enable them to supply plant air at minimum cost by reducing operating and maintenance expense. Your Joy representative can supply complete details, or write for Bulletin 925-13.

AIR MOVING EQUIPMENT FOR ALL INDUSTRY

JOY

Joy Manufacturing Company
Oliver Building, Pittsburgh 22, Pa.

In Canada: Joy Manufacturing Company (Canada) Limited, Galt, Ontario

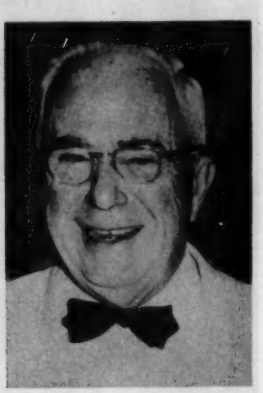
Circle 657 on Page 45

Men of Industry

PAUL L. McCULLOCH JR.
. . . American Brake Shoe appointments

WILLIAM D. RADDATZ
. . . American Brake Shoe appointments

MARIO GUERRA
. . . GE foundry engineer



DUDLEY V. WALKER
. . . retires after 41 years

Paul L. McCulloch Jr. has been elected a vice president, American Brake Shoe Co., New York, and group executive of a newly formed castings group which includes the American Manganese Steel, Electro-Alloys, Engineered Castings, and National Bearing Divisions. **William D. Raddatz** has succeeded Mr. McCulloch as president of the Electro-Alloys Div., Elyria, Ohio, a position Mr. McCulloch has held since 1955. Mr. Raddatz was vice president of Electro-Alloys.

Stuart Z. Uram has joined the metallurgical staff, Hitchiner Mfg. Co., Milford, New Hampshire. Initially, he will work on investment casting developmental projects, including new alloys and solidification phenomena.

Mario Guerra has been named foundry engineer at the pilot foundry, Large Jet Engine Department Research Laboratory, General Electric Co., Evendale, Ohio. Mr. Guerra was with the Solar Research Corp. before he joined General Electric in 1959. **T. E. Millard**, formerly with the laboratory, has joined National Precision Casting Co., Paoli, Pa.

Howard M. Brownrigg has been named vice president in charge of steel foundry products, and **John A. McVicker** vice president in charge of railroad products, Dominion Brake Shoe Co., Montreal, Que. Since 1957 Mr. Brownrigg has been vice president of manufacturing of the company's Joliette Steel and Manitoba Steel Foundry Divisions. Mr. McVicker became vice president of the Canadian Ramapo Div. in 1956.

Dudley V. Walker, vice president and director, Eastern Malleable Iron Co., Naugatuck, Conn., and managing director of its Eberhard Mfg. Div., Cleveland, since 1943, has retired. He joined the company in 1919. Mr. Walker is immediate past president of the Malleable Founders Society.

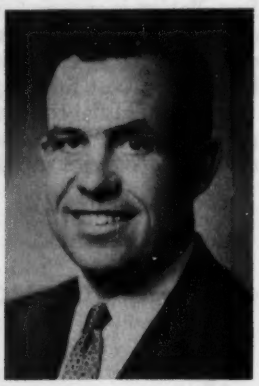
William E. Schrell recently joined Crosby Foundry Sales, Rocky River, Ohio, as a sales engineer in western Ohio.

A. Donald Moll, assistant sales manager, has been named sales manager, Minneapolis Electric Steel

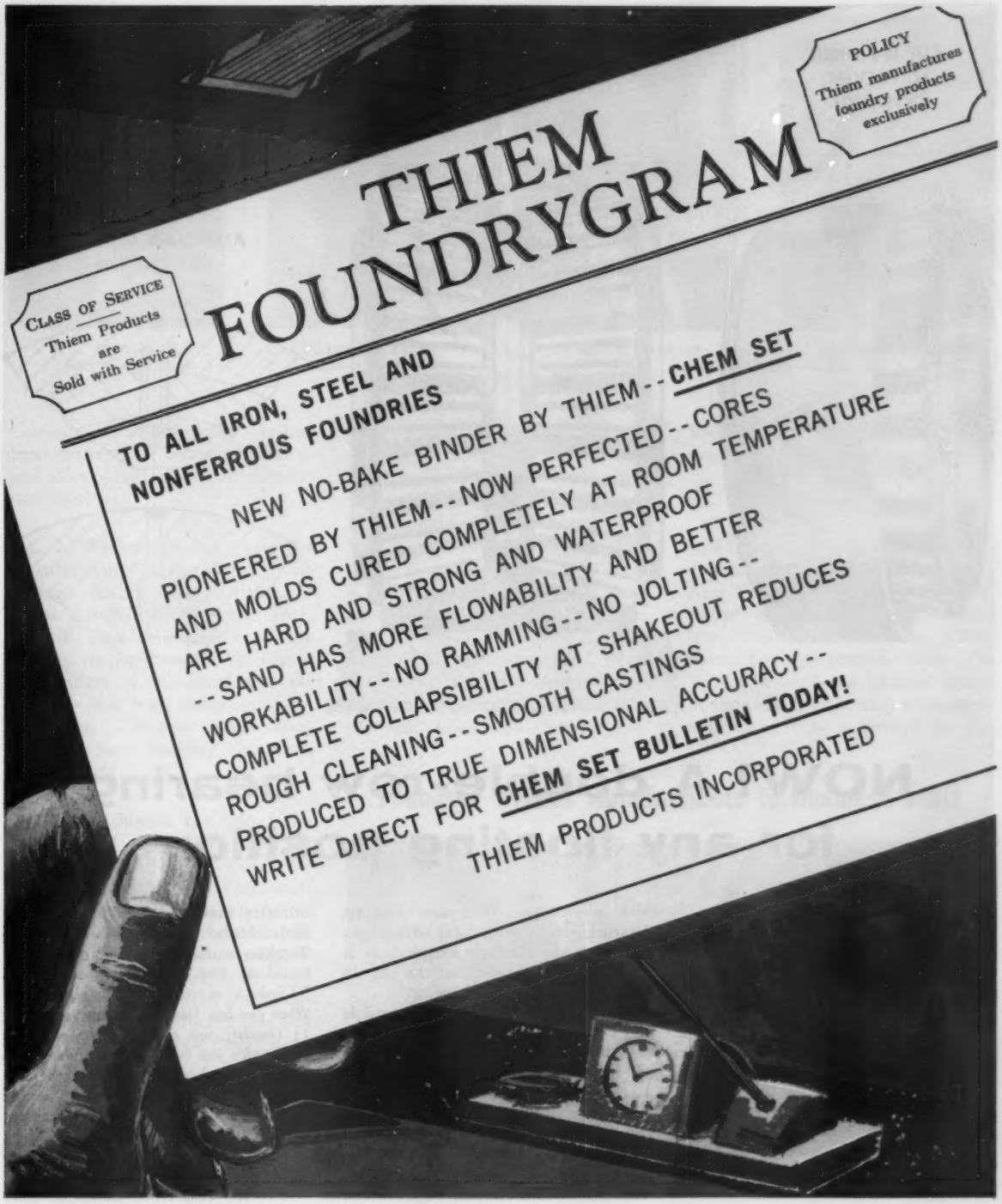
STUART Z. URAM
. . . joins Hitchiner Mfg. Co.

HOWARD M. BROWNRIGG

JOHN A. McVICKER
. . . Dominion Brake Shoe executives



A. DONALD MOLL
. . . becomes sales mgr.


POLICY
Thiem manufactures foundry products exclusively
THIEM FOUNDRYGRAM
CLASS OF SERVICE
Thiem Products are Sold with Service
TO ALL IRON, STEEL AND NONFERROUS FOUNDRIES
NEW NO-BAKE BINDER BY THIEM--CHEM SET
PIONEERED BY THIEM--NOW PERFECTED--CORES AND MOLDS CURED COMPLETELY AT ROOM TEMPERATURE ARE HARD AND STRONG AND WATERPROOF --SAND HAS MORE FLOWABILITY AND BETTER WORKABILITY--NO RAMMING--NO JOLTING-- COMPLETE COLLAPSIBILITY AT SHAKEOUT REDUCES ROUGH CLEANING--SMOOTH CASTINGS PRODUCED TO TRUE DIMENSIONAL ACCURACY--
WRITE DIRECT FOR CHEM SET BULLETIN TODAY!
THIEM PRODUCTS INCORPORATED

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Elmira, New York
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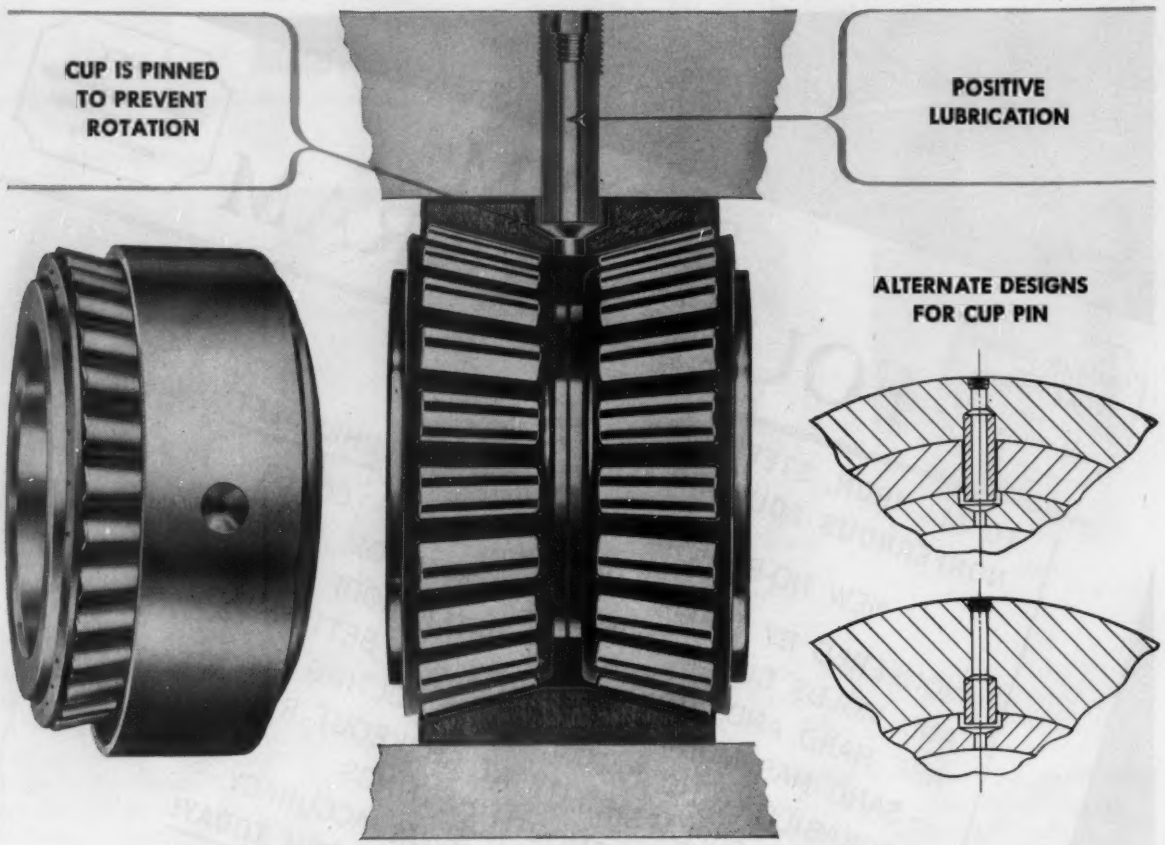
Thiem
PRODUCTS INCORPORATED
Milwaukee 19, Wisconsin

Circle 658 on Page 45



NOW! A double-row bearing for any floating position

REDUCES WEAR AND POUNDING
PROVIDES FOR POSITIVE LUBRICATION

Now you can get a new Timken® bearing—first of its kind developed for floating bearing positions—that answers the problem of excessive wear from creeping and pounding in gear drives, spindles and many other applications. It's a pin-cup, double-row tapered roller bearing. Manufacturers can assemble and adjust gear drives, then merely set the pin. Result is a bearing that floats endwise but cannot turn in the housing. It greatly reduces wear, provides for continuous, positive lubrication. This new Timken bearing gives you all these advantages for those applications where there is an inherent tendency for the cup to creep or turn in the housing.

1) *Positive lubrication* because oil is fed continuously through the pin.
2) *Longer bearing life* because bearing creep is eliminated. Related parts are better protected, too.

This new pin-cup bearing results from Timken bearing research and development. Research to make machines perform better at lower cost. And the combined, new $2½ million engineering and research facilities of the Timken Company, unique in the industry, make progress like this possible. Make it yours when you use Timken bearings in the machines you build or buy. Another reason why "Timken" is your No. 1 bearing value.

When you buy Timken bearings you get...
1) Quality you can take for granted.
2) Service you can't get anywhere else.
3) The best-known name in bearings.
4) The pace setter in lower bearing costs. The Timken Roller Bearing Company, Canton 6, Ohio. Cable: "TIMROSCO". Makers of Tapered Roller Bearings, Fine Alloy Steel and Removable Rock Bits. *Canadian Division: Canadian Timken, St. Thomas, Ontario.*

Industry rolls on

TIMKEN®

tapered roller bearings

See you at the AISE Show, Cleveland Public Auditorium, September 27-30 Booths 134-137

Circle 659 on Page 45

L. L. WHITNEY JR.
. . . joins Union Carbide

LeROY E. TAYLOR
. . . becomes gen. sales mgr.

ERNEST W. WEAVER

WILLIAM B. WALLIS
. . . receive Trinks Awards

Castings Co., Minneapolis. He had been manager of technical services and sales of high-alloy and stainless steel castings.

L. L. Whitney Jr. has joined the Metallurgical Service Div., Union Carbide Metals Co., division of Union Carbide Corp., New York. He will serve as a member of the foundry service group in the Cleveland offices of the division. He formerly was with American Steel Foundries, Chicago, and West Michigan Steel Foundry Co., Muskegon, Mich.

George Liberton has joined the metallurgical engineering staff of the technical division, Vanadium Corp. of America, New York, with headquarters at its research center in Cambridge, Ohio, where he will engage in technical liaison research and development work with open hearth, oxygen converter, and bessemer process steel producers. He was formerly with Republic Steel Corp., Youngstown, Ohio.

James T. Greenlee, vice president and manager of the industrial sales division of Imperial Brass Mfg. Co., Chicago, has retired after 50 years with the company. **Thomas Douglas** will succeed Mr. Greenlee as manager of the industrial sales division.

Kenneth F. Beckley Jr. and **Curry A. Lindsey** have been appointed assistant foremen in material control, West Allis Works, Allis-Chalmers Mfg. Co., Milwaukee. **Thomas J. Kuczkowski** has joined the foundry engineering staff, West Allis Works; and **Rudolph M. Maris** has been named to the materials management staff, Norwood Works, Norwood, Ohio. All four men recently completed Allis-Chalmers' training course for graduate engineers.

LeRoy E. Taylor, formerly manager, foundry sales, Ottawa Silica Co., Ottawa, Ill., has been appointed general sales manager. **Jerald E. Pixley,** formerly assistant sales manager, has been appointed sales manager, Glass and Ceramic Div.

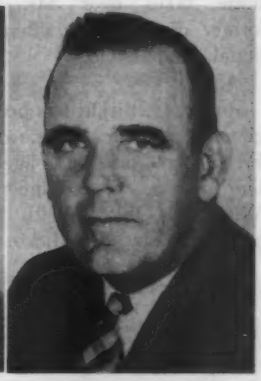
William H. Woodward, former vice president of sales, is staying with the company in an advisory capacity.

William B. Wallis, consulting engineer, Strategic Materials Corp., New York, and **Ernest W. Weaver,** retired engineering executive, Surface Combustion, Toledo, Ohio, have been presented with the Trinks Award—the highest honor in the industrial heating equipment industry. It is sponsored by *In-*

Foundry Makes Appointments to Business Staff

EARL H. THOMAS

THOMAS H. DOENGES



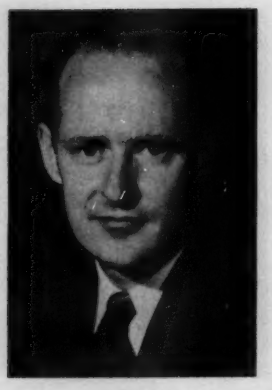
JOSEPH C. SULLIVAN

Several changes have been made recently on the business staff of FOUNDRY. Earl H. Thomas, for the last five years regional manager in the Ohio territory, has been named advertising director. Thomas H. Doenges has been appointed to handle advertising sales in the Michigan territory, working with A. W. Johansen, regional manager, Chicago. He was formerly in advertising agency work in Detroit.

Joseph C. Sullivan is the new Pittsburgh district manager. For the last ten years he was district manager there for *Steel.* His territory will include northeastern Ohio, western Pennsylvania, and western New York. Kenneth L. Mountain, Cleveland district manager, will cover the remainder of Ohio and central Indiana.

RALPH KAWECKI
. . . g.m., Southington Foundry

RUSSELL A. ZIEGE
. . . joins Foundry Specialties



MAURICE GORMLY

PHILIP O. GEIER JR.
. . . Cincinnati Milling Machine Co. promotions

dustrial Heating. These two men are pioneers in the development of electric arc melting furnaces and heat treating furnaces, respectively. Mr. Wallis formerly was president, Lectromelt Furnace Div., McGraw-Edison Co., Pittsburgh.

Ralph Kawecki has been named general manager, Southington Foundry Co., Southington, Conn.

Hermann K. Intemann has been made director of purchases, Union Carbide Corp., New York. **William H. Feathers** succeeds Mr. Intemann as president of Union Carbide Metals Co. **James R. Johnstone** takes over Mr. Feathers' former duties as president of National Carbon Co.

Robert G. Birkin has been named general sales manager, and **J. G. Frischkorn,** sales manager, Cleveland Crane & Engineering Co., Wickliffe, Ohio. With the company 33 years, Mr. Birkin has been sales manager of the Heavy Machinery Div. Mr. Frischkorn was sales manager of the Cleveland Tramrail Div.

Russell A. Ziege, formerly with Burnham Pattern Inc., Milwaukee, has joined Foundry Specialties Mfg. Inc., there as plant manager.

Henry Finger, formerly manager of production, Duraloy Co., Scottdale, Pa., has been transferred to the sales department.

Emil A. Axelson has been appointed district sales manager in the Pittsburgh home office, Refractories Div., H. K. Porter Co. He has been a steel mill specialist with the division.

Herbert L. Klopf, for several years sales and service engineer, Theim Products Inc., Milwaukee, has been made plant manager of the company's new subsidiary, Universal Refractories Corp., Greenville, Pa.

Philip O. Geier Jr. has been elected vice president and appointed assistant general manager, Cincinnati Milling Machine Co., Cincinnati, Ohio. **Maurice Gormly** succeeds Mr. Geier as manager of the products division. He formerly was director of the grinding wheel laboratory and manager of the grinding wheel plant.

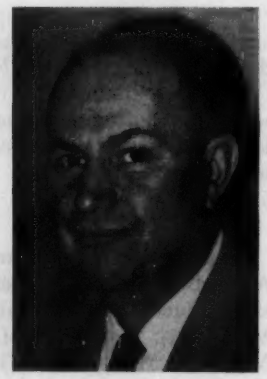
Chester H. Pedersen, for nine years in sales with Electric Steel Foundry Co., Portland, Oreg., has been appointed sales manager of the company's Seattle district. **James N. Dodson** has been transferred from Pacific Northwest sales to Honolulu, Hawaii, as office manager. **Joseph Bonawitz** has been appointed salesman for Esco in Honolulu, and will also represent Hyster Co., Portland.

Steve Denkinger, formerly sales representative, Shalco Div., National Acme Co., Cleveland, has been named sales manager of the new

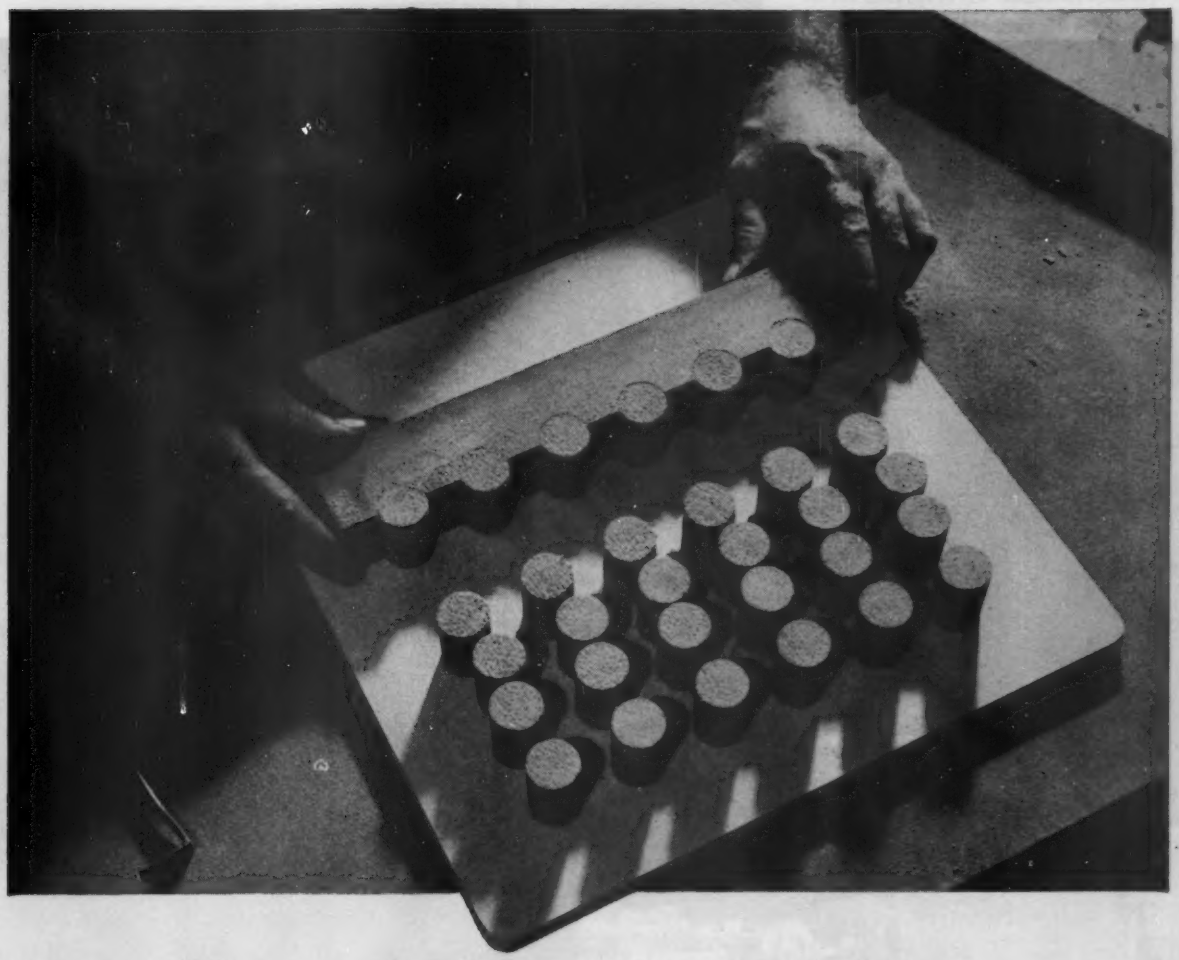
J. G. FRISCHKORN

ROBERT G. BIRKIN
. . . Cleveland Crane & Eng. promotions

HERBERT L. KLOPF
. . . becomes plant mgr.



STEVE DENKINGER
. . . joins Milwaukee Chaplet



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Tough asbestos-cement composition keeps them true over long service life

Experienced foundrymen know they can depend on Transite® Core Plates for fast, accurate production of precision cores, day in and day out . . . even under heaviest production schedules.

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Whether or not you now use Transite Core Plates, there are many gains to be had from a careful study of our new folder IN-219A. It gives complete specification data—weights, sizes, thicknesses. *Send the coupon below.*

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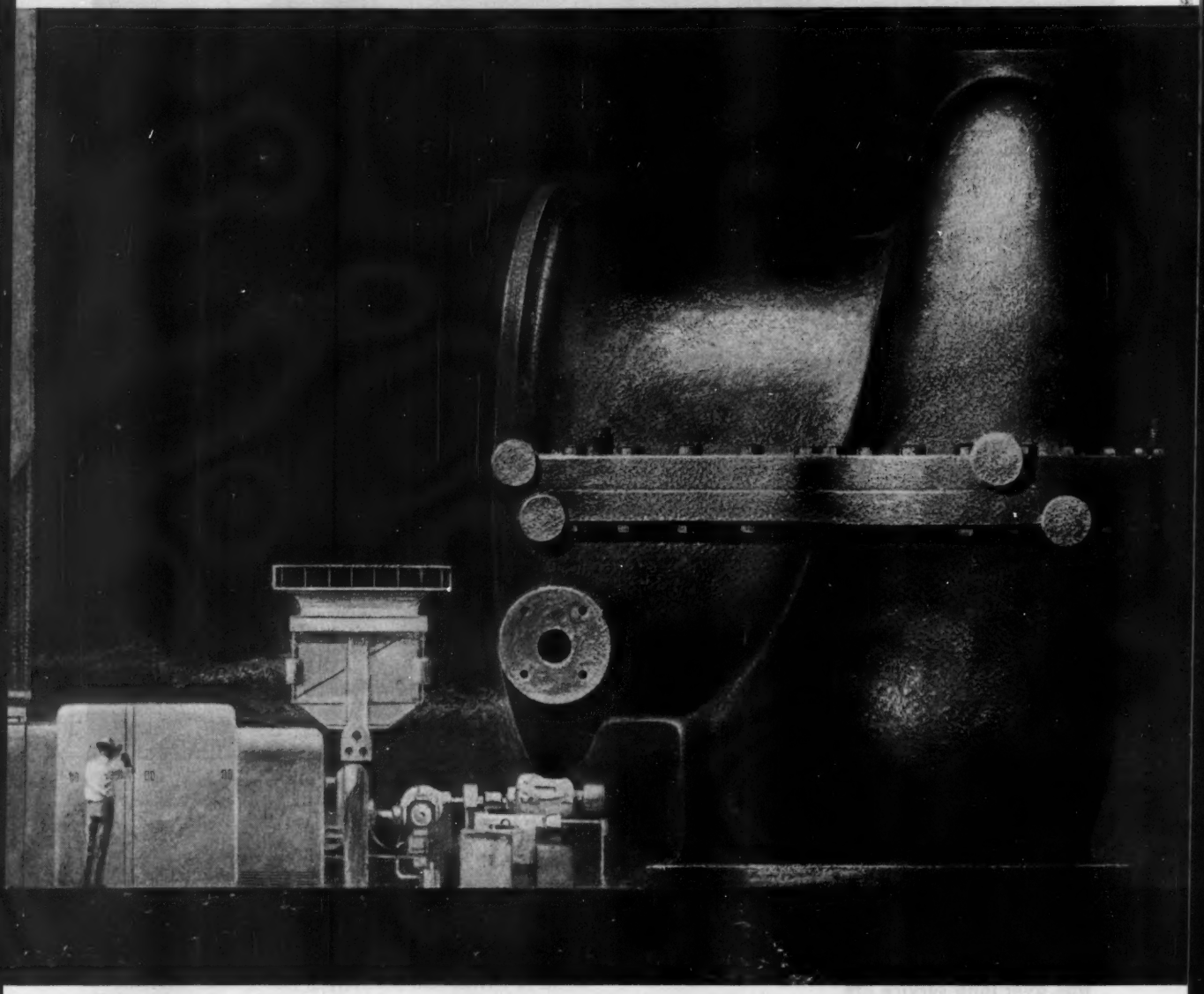
Circle 660 on Page 45

How the Foundry Industry Serves America . . . #8 of a Series



IRON CASTING EFFECTS 4-WAY SAVING OVER WELDMENT

Substitution of high strength gray iron in this compressor discharge casing resulted in an important 4-way saving: 38% saving in weight, 58% saving in material cost, 25% saving in manufacturing time, and 34% saving in machining cost, as well as a considerable saving in shipping costs.

Originally the casing was made as a cast-weldment. It was redesigned, however, to take advantage of the fluidity of molten cast iron and its low shrinkage during solidification. These characteristics permit successful gray iron castings to be designed in shapes which are impossible with other materials or processes.

Because the iron could be placed exactly where needed, it was not necessary to build up the weight of the part by the use of fastening devices, welding or multiple pieces. Neither did it require costly machining.

This is factual proof that modern iron castings can deliver outstanding performance and impressive economies when specified by industrial designers.

For the production of structurally sound and economical iron castings, Hanna Furnace provides foundries with all regular grades of pig iron . . . including foundry, Bessemer, intermediate and low phosphorous, as well as HANNATITE® and Hanna Silvery.

Facts from files of Gray Iron Founders' Society, Inc.

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THE BEST KNOWN NAME IN IRON

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Buffalo • Detroit • New York • Philadelphia

Hanna Furnace is a division of **NATIONAL STEEL CORPORATION**

Circle 661 on Page 45

WILLIAM C. KEELEY GEORGE L. WEISSENBURGER GEORGE C. FLOYD
. . . Vanadium Corp. of America executives

Equipment Div., Milwaukee Chaplet & Supply Corp., Milwaukee.

William C. Keeley, president, Vanadium Corp. of America, New York, since 1949, has been elected chairman of the board. **George L. Weissenburger,** formerly vice president, succeeds Mr. Keeley as president. **George C. Floyd,** vice president since 1951, has been named senior vice president of the company.

J. Robert Lowry and **Robert D. Stubblebine** have been named field engineers for Norton Co., Worcester, Mass., in Atlanta and Detroit, respectively. They became company trainees last year.

Hiram A. Carpenter has been named assistant to the vice president, Coke & Iron Div., Pittsburgh Coke & Chemical Co., Pittsburgh. He has been with the company since 1948 and has served as assistant manager of purchases, assistant manager of chemical procurement, and sales manager for coke by-products.

C. C. Kaesemeyer has been appointed executive vice president, Fuller Co., Catasauqua, Pa., a subsidiary of General American Transportation Corp., Chicago. He formerly was general sales manager. **Donald S. Douglass,** former assistant general sales manager, has been named vice president, division sales coordination, and **Jack L. Prather,** former patent attorney and legal counsel, has become assistant to the president.

John McKane has been named sales manager and **Ken Weber** assistant sales manager, Engineered Ceramics Mfg. Co., Chicago. Mr. McKane will be in charge of all sales, domestic and foreign.

E. G. TETZLAFF

CHARLES J. ANGERS

Mr. Tetzlaff was named assistant plant manager, and Mr. Angers, superintendent of the steel foundry, Texas Foundries Inc., Lufkin, Tex., as reported in June

In the interest of the American foundry industry, this ad (see opposite page) will also appear in

STEEL
IRON AGE
MODERN CASTINGS
AMERICAN METAL MARKET

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Circle 661 on Page 45

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REFRACTORY GATING COMPONENTS

• The *Thinwal* construction, providing as much as *35% lighter weight* will not spall nor erode in use even at temperatures up to 3250°F. They eliminate slag inclusions, stop rejects, reduce cleaning room time.

Standards and specifications bulletin available on request. Units for special applications quoted.

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P.O. Box 1631

Circle 662 on Page 45

Obituary

Edgar Eugene Ballard, 68, senior consultant, and, until his retirement in 1955, chief engineer, Lester B. Knight & Associates Inc., Chicago, died June 22. He entered the foundry industry in 1923 with St. Louis Frog & Switch Co., St. Louis, as chief engineer. In 1933, he joined National Bearing Div., American Brake Shoe Co., St. Louis, where he was division plant engineer until going with Lester B. Knight & Associates in 1946. Mr. Ballard was a past chairman of the St. Louis Chapter, American Foundrymen's Society.

Hartwell H. Whitney, 51, since 1943 manager of the analytical section of the Metallurgical Dept., Electric Steel Foundry Co., Portland, Oreg., died May 22, after almost 17 years with the company. In addition to supervising the chemical laboratory, he aided in introducing direct reading spectrographic analysis and installation of the company's 24 million volt betatron.

William F. Van Eweyk, 65, former president of the old Milwaukee Brass Mfg. Co., Milwaukee, died June 8, at his home in Whitefish Bay, Wis.

Edward A. DeGraff, 72, erection superintendent, Newaygo Engineering Co., Newaygo, Mich., died May 2, in Grand Rapids.

Book Review

Transactions of the Vacuum Metallurgy Conference — 1959 edited by Rointan F. Bunshah, paper, 212 pages, 8½ x 11 in., published by New York University Press, New York, N. Y. Price, $7.50.

This volume is a collection of papers on new research and advanced engineering information presented at the third annual meeting on vacuum metallurgy held in 1959 at New York University.

Such topics as vacuum arc melting and casting, vacuum investment casting, vacuum induction melting, and vacuum degassing are covered.

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Circle 663 on Page 45

BRASS AND BRONZE FOUNDRYMEN . . .

Do You Have the Answers to Your Casting Problems?

You can find them in

BRASS AND BRONZE FOUNDRY PRACTICE

By HARRY M. ST. JOHN

Here are a few of the dozens of questions this book will answer for you:

- **How can you reduce metal loss?**
- **What are the advantages of synthetic sand?**
- **How can casting feeding be improved?**
- **What type of melting fits your operation?**
- **Which molding method should you use?**

Written to simplify and solve the problems of practical foundrymen, this book is the only up-to-date, comprehensive work available on production of brass and bronze castings. The author has a background of many years of experience, most recently as superintendent in charge of the brass foundry at Crane Co. In 1947, he was awarded the William H. McFadden Gold Medal for his many outstanding contributions to the society and the industry. Order your copy today.

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the controlled silicate CO_2 binder

MORE SPEED. Curing time ranges from ten seconds to three minutes, depending on type of mold or core.

MORE LABOR SAVING. Cores are ready for use when they come from core box. You eliminate movement to and from ovens, handling of core driers, cementing of halves.

MORE FLEXIBILITY. Fast curing means faster handling of rush orders. There's no need to stockpile cores for future orders. You have the flexibility to meet customer needs on schedule.

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MOROC COMES IN FOUR GRADES

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Diamond Chemicals

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Let us know your specifications on welded constructions. We have up-to-date facilities for production of carbon or stainless steel and aluminum, from 1/16" to 4" thick.

Call or write for estimate. You'll find it economical to work with us on your requirements for tanks, chutes, hoppers, machine bases, stacks, breechings, angle rings, special cars, buckets and other equipment.

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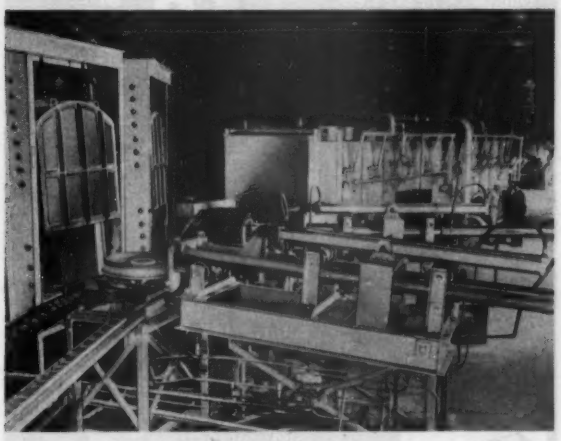
Circle 667 on Page 45

The Shakeout

Preheat Furnace Speeds Up Heat Treatment

INSTALLATION OF a specially designed preheat furnace has increased efficiency of heat treatment of railroad car wheels 25 per cent at Griffin Wheel Co.,



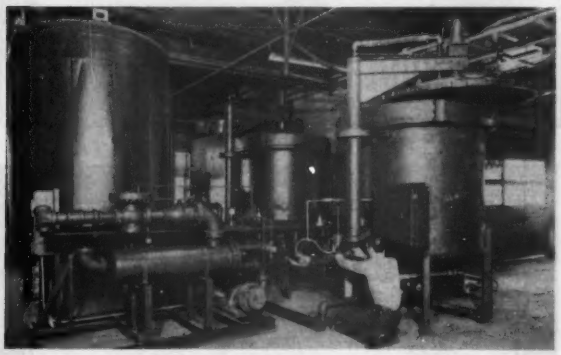
Colton, Calif. Engineered and designed by the Industrial Div., Lindberg Engineering Co., the automated installation speeds up the heat treating operation.

In the process, car wheels are conveyed automatically into the preheat furnace and brought quickly to the desired temperature. Wheels then are conveyed automatically into a Lindberg rotary hearth furnace.

For More Details Circle No. 517—Page 45

Impregnation System Will Seal Auto Parts

BELIEVED TO BE the largest fully automatic, batch-type impregnation system ever built, this dual autoclave machine is nearing completion at Prenco Mfg. Corp., Royal Oak, Mich. It is scheduled for delivery to an automotive company which will use it with metal oxide



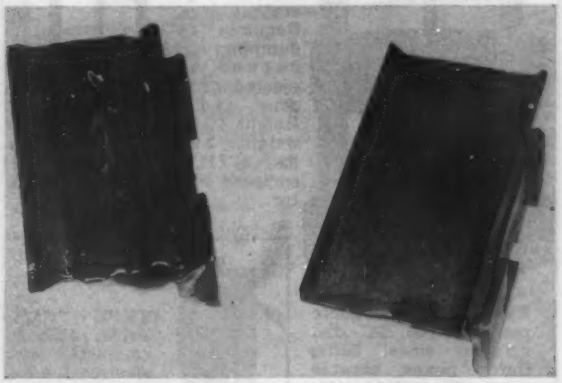
sealant to impregnate cast aluminum engine parts for a new compact car.

The system consists of two 5-ft x 5-ft capacity autoclaves, a sealant supply tank, a hot water recovery tank, and suitable automatic valving, safety devices, and electrical controls. A new operating feature designed into the equipment is a hot water rinse system which permits washing of parts in the autoclave following impregnation. This technique is said to achieve a thorough removal of excess sealant.

For More Details Circle No. 518—Page 45

Airless Blast Cleaning Blades Have Long Life

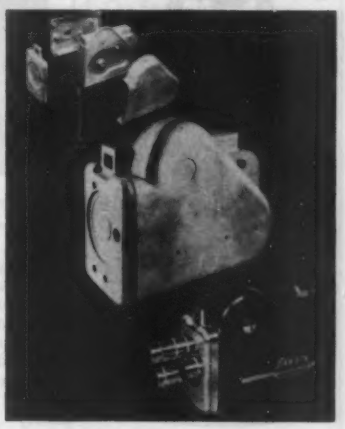
HARD CARBIDE blades used in an Ohio foundry to throw steel grit in a shot blast cleaning machine are said to have been used for 5453 hours and still to be good for several thousand more hours of service. One of these blades, made by Kennametal Inc., Latrobe, Pa., is shown here on the right. On the left is a steel



blade used for only 113 hours. The tungsten carbide blades were used to grit blast bathtub and lavatory castings for enameling.

For More Details Circle No. 519—Page 45

Sound Movie Camera Uses Aluminum Diecastings



NEW INNOVATION in home movie cameras is the Fairchild Cinephonic Eight, which records sound simultaneously with action. Of the camera's total weight of 4½ lb, 2¾ lb consist of four aluminum diecastings which make up the basic frame, as shown here. Supplied by Aluminum Co. of America, the aluminum was used because of its lightness, castability, and finishing versatility.

The camera will shoot 800 ft of film before its battery requires recharging from an ordinary light socket. A microphone and head set are provided to pick up and monitor sound. Manufacturer is Fairchild Camera & Instrument Corp.

For More Details Circle No. 520—Page 45

DOUBLE PRODUCTION! HALVE YOUR COST! Combs Gyratory Riddles

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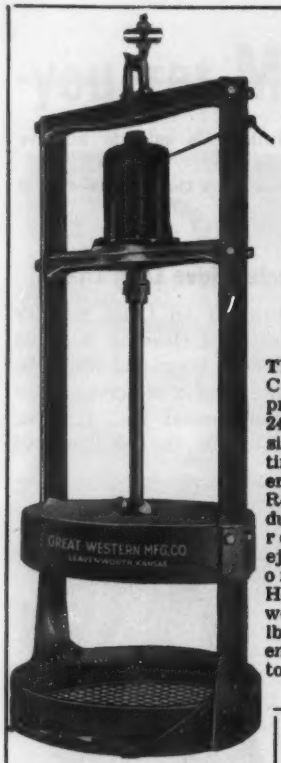
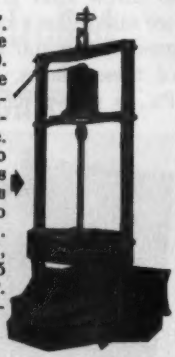


TYPE "CS". Complete price $395.00. 24" square sieve. A continuous operation sieve. Requires no dumping, as refuse is ejected off to one side. Height 4'10", weight 295 lbs, ¼ H.P. enclosed motor.



TYPE "CR". Complete price $385.00. 24" dia. round sieve. Sifts, fluffs, mixes, aerates sand. Height 4'6", weight 250 lbs., 1/3 H.P. enclosed motor.

TYPE "HL". Price $285.00 complete, less sieves. Laboratory model especially designed for laboratory sand control, fitted with 1/6 H.P. enclosed motor.

PROMPT DELIVERY from your Foundry Supply House

TYPE "V". Price, 20" Sieve, $300.00. Does the work of 10 men. Screens sand, Fine, Medium, and Coarse. 20" dia. sieve with special clamp for 5-second changes. Height 4'6", weight 100 lbs., fully-enclosed 1/6 H.P. motor. Also available in Giant V-5 with 36" sieve for triple capacity . . . Price $545.00.

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Euclid HOISTS
SERIES
"S" for Satisfactory Service... Sensibly Priced
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Where a low investment is desired, with all operating features not required, this plain trolley is ideal.
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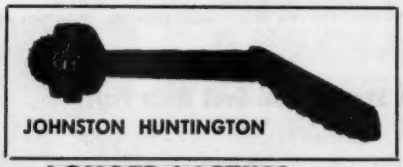

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Planes stock up to 24" wide, 8" thick, as short as 11". Circular safety type cylinder, 3-knife standard, 4½" cutting circle. Sectional chipbreaker, sectional infeed roll and permanently located knife grinding and jointing attachment. All controls located in front of operator. Send for folder giving complete technical details.

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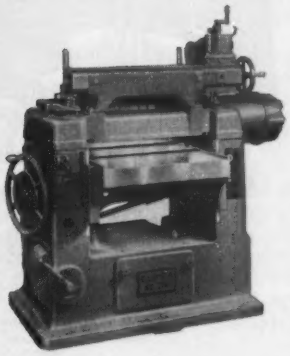

"OLIVER" — *famous for Precision Machinery*

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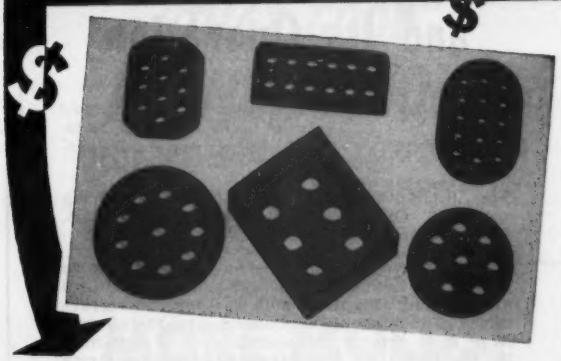

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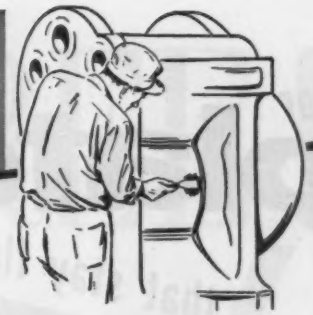

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TIGHT, LASTING REPAIRS

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THREE DIFFERENT SHADES

With 3 different shades to pick from, you know you can get a close match for your castings.

4AA—Light gray, fine texture
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UNIFORM QUALITY

Rigid quality control means you can be sure that the strength and color of Smooth-On Foundry Cements will not vary from one order to the next. Every lot of Smooth-On cements is laboratory tested and must satisfy tests for setting time, hardness, and color before it is packed for shipment.

FREE SAMPLES

Why not try one or more of these Foundry Cements at our expense? We will be glad to send you a free sample of any of the cements described above if you will write us on your business letterhead. Write today, and see how Smooth-On can improve the appearance of your castings.

SMOOTH-ON MANUFACTURING CO.
570 Communipaw Ave., Jersey City 4, N. J.

SMOOTH-ON
FOUNDRY CEMENTS

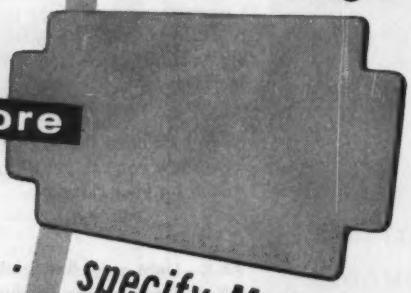
60-389

Circle 674 on Page 45

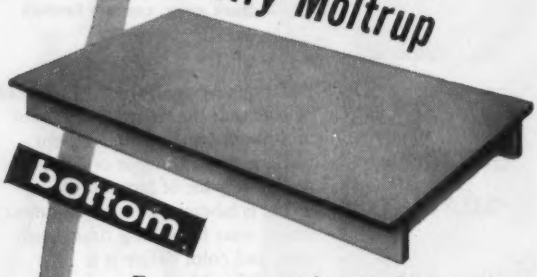
for **plates**

... that stay flat

... and last longer



... specify Moltrup



For accurate casting results specify Moltrup Plates. They are long-lasting and stay flat—because Moltrup employs a special flattening process designed to permanently eliminate buckling or bending. Consequently your investment goes further and your profit margin increases. Plates are made to your specifications. Write or phone us for complete information.

Phone: TIlden 6-3100

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Beaver Falls, Pa.

Pittsburgh, Pa. Erie, Pa. Chicago, Ill. Detroit, Mich.
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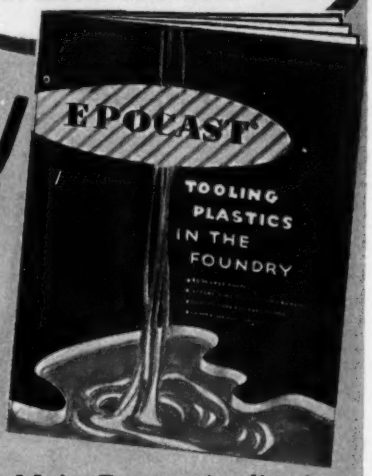
F-2

DETAILS OF PLASTIC PATTERNMAKING REVEALED

Free!

SEND FOR YOUR COPY TODAY!



Describes Ten Major Pattern Applications

Eight big pages of technical facts, mixing proportions, curing data, pot life, results in application, coatings, release agents and new safety hardeners. Send for your free copy today.

furane plastics INCORPORATED
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The Cupola and Its Operation

A comprehensive text on cupola operation for the metallurgist, foundryman and student of foundry technology . . . . . .

The 35 chapters are grouped into the following sections: Operations, Equipment, Materials, Principles related to Operation.

Latest developments, such as hot blast, basic lining for nodular iron, and emission control are covered. Chapters such as those on refractories, principles of combustion, and metallurgy have been greatly augmented or are presented for the first time. More than 50 of the country's outstanding foundrymen have contributed their knowledge and experience to make this book available on cupola operation.

54 tables	Price:
300 pages	$11.00
8 x 11	Postpaid

FOUNDRY
Book Department
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with a STEPHENS-ADAMSON
BELT CLEANER

WRITE FOR BULLETIN 253

Check these features

- Inexpensive, but most effective belt cleaner ever developed.
- Removes wet, dry or sticky material from belt.
- Prevents material from being ground into belt.
- No messy dribble to be cleaned up.
- Will not injure belts or catch on splices.
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S-A

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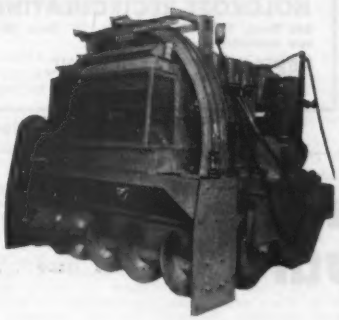
Circle 678 on Page 45

MORE MOLDS!

You can get up to 25% more molds per hour simply by removing your sand from the floor and cleaning, mixing, aerating and tempering it with a RINGLIFT SAND CONDITIONER. One man can do it. What you save will quickly pay for one of these amazing machines in only a few months. Ask us how today!



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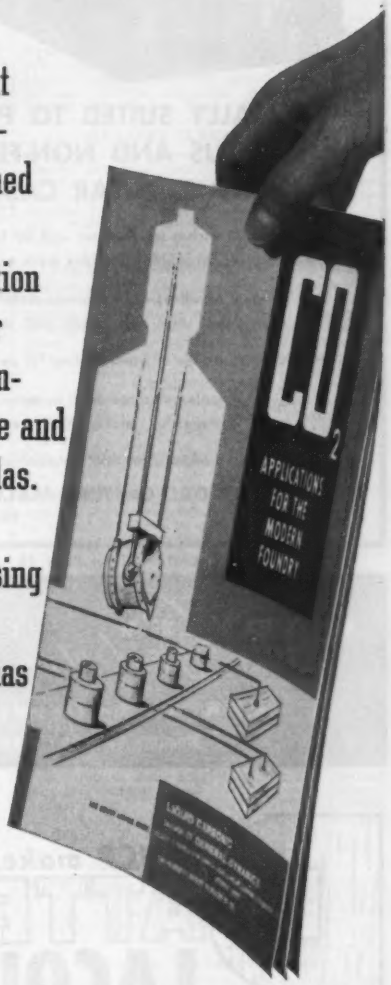
FREE!

It's only eight pages long—
But it's jammed with vital information about CO_2 for foundries. Contains new core and binder formulas. Illustrates complete gassing kits. First time anyone has ever offered such a complete manual. Send for yours today.



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Please send me your new, free booklet "CO_2 Applications for the Modern Foundry."

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Circle 680 on Page 45

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MODEL K

SPECIALLY SUITED TO PRODUCE FERROUS AND NON-FERROUS LONG TUBULAR CASTINGS

Castings up to 32 inches in diameter and 20 feet in length. These machines are ideal for jobbing foundry work as well as production.

Cast tubes of all alloys of non-ferrous metal as well as cast iron, alloy irons, steel, alloy steels and stainless steels.

Highly efficient type of water-cooling for permanent molds.

Trunnion machines built in many size ranges for specific requirements.

Illustrated Folder No. 160 Available on Request.

CENTRIFUGAL CASTING MACHINE CO.
P. O. BOX 947 TULSA 1, OKLAHOMA

Circle 681 on Page 45

NEW
***FAS-LOK* STORAGE RACK**

- ONLY 2 BASIC PARTS . . . QUICK ERECTION
- NO WEDGES . . . NO BOLTS, NUTS, OR TOOLS REQUIRED
- SAFE . . . RUGGED . . . *COMPLETELY ADJUSTABLE*
- Easy access — front or rear.

FAS-LOK Racks can be quickly assembled into unlimited combinations of height, length, and shelf opening. Rigidly braced end frames, in standard heights from 5′ to 22′ 6″, have slots punched in uprights on 3″ centers. Horizontal runners have hookplates at each end. Each hookplate has two tapered ears which fit slots of upright (inset). To assemble FAS-LOK Racks, ears are set into the wedge-shaped slots on upright and a tap on horizontal runner drives ears down, seating them securely in a wedging action to produce a rock-solid rack. Can be used to store any material—Pallets, Skids, Rolls, Bulk storage, etc.

Horizontal runners available in lengths to 20 ft.; End Frames in depths from 2′ to 5′. End Frames made in capacities to 40,000 lbs. *Write for Catalog*

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Originators of Fully Automated Sand Systems for Foundries

■■■ Full details will be sent promptly on complete systems • Sand Controls • Moisture Controls • Mixer Timers • Bond Feeders • Bin Controls • Mixer Selectors • Pneumatic Transporters

Circle 683 on Page 45

NCP makes effective
PATTERN LACQUERS

1. Seals pattern to prevent moisture and water absorption.
2. Brushes easily—dries quickly.
3. Does not chip, peel, bubble, or blister, and is flexible.
4. Adds slip, promoting clean parting of pattern from sand.
5. Made in all colors.
6. Time tested material—successfuly used in pattern shops all over the country for over 30 years.

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FOR SALE
HOLCROFT GAS FIRED

P & K INC.

RADIANT TUBE BRIGHT HARDENING FURNACE with 36″ wide cast link belt, 15′ long effective heating, and conveyorized quench.

HOLCROFT RECIRCULATING DRAW FURNACE gas fired, 1250° F, 36″ wide, 20′ long. Write for list of other furnaces now available at:

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Circle 685 on Page 45

Use an Inquiry Card

For further information on anything described or advertised in this issue . . . . . .

SEE Page 45

CLASSIFIED ADVERTISING

• HELP WANTED

ENGINEER

With substantial foundry design and layout experience. Knowledge of modern material handling equipment and material flows required. Real opportunity with excellent salary, bonus and profit sharing. Degree is essential. Send complete details in confidence.

BOX 478, FOUNDRY
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MANAGER—SUPERINTENDENT

Mid-west nonferrous foundry, over $1,000,000 annual sales. Floor and production molding in sand, aluminum permanent mold and heat-treating. Position backed by staff for departmental budget, quality, metallurgical control, methods, standards. Young, aggressive management planning for growth. State experience, qualifications, salary. Address: Box 493, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

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For medium sized steel foundry—Chicago Area, 6000 lb. Electric Furnace. Must be able to melt and run chemicals. Send resume and references to Box 470, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

CHIEF MELTER

Experienced electric arc furnace. Acid practice—carbon, low alloy and stainless steels—full charge of furnace and ladle practice. Induction furnace experience helpful. Salary open. West Coast location. All answers strictly confidential. Address: Box 462, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

WANTED

Experienced Steel Foundry Molding Foreman. Must know heading and gating. Excellent opportunity. Chicago area. Address: Box 463, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

SALES ENGINEER

Experienced in steel castings. Chicago and surrounding area. Good opportunity for right person. Address: Box 467, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FLOOR MOLDING FOREMAN

Wanted by long-established foundry in Southwestern Ohio. Must have supervisory experience and be thoroughly familiar with stainless steel casting. Position offers top wages and excellent working conditions to right person. Pension, many fringe benefits, including excellent insurance program. Send complete resume. Address: Box 490, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

SUPERINTENDENT FOR GRAY IRON FOUNDRY

Thoroughly experienced in cupola and molding practices on castings from one hundred pounds to three tons. Well established foundry, Chicago area, employing 75 men. Please mail complete resume. All information confidential.

BOX 457, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

EXPERIENCED FOUNDRYMAN WANTED

Age 40 to 50. With thorough knowledge of all phases of foundry work. Salary commensurate with experience. Please reply to. . .

BOX 497, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

INDUSTRIAL ENGINEER

Opportunity for graduate engineer experienced in methods and time standards for a large diversified steel foundry in New England. Foundry experience important but not essential. Must be capable of supervising small group. Salary commensurate with qualifications. Send resume to: Box 487, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

SAND TECHNICIAN

Knowledge of CO_2 shell core and nonferrous molding sands. Send complete details on work history. Opportunity to advance to supervisory position. Send recent photo. Address: Box 458, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

• HELP WANTED

PLANT MANAGER'S ASSISTANT

For cast iron plumbing fixture plant. Needs rounded out knowledge to back up manager. Address Box 472, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

MELTING FOREMAN

For Large Bronze Foundry. Experienced in variety of bronze alloy castings from one to 7000 lbs. Located in North Jersey Metropolitan Area. Reply with resume.

BOX 474, FOUNDRY
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SUPERINTENDENT

Experienced brass foundry Superintendent capable of taking complete charge of all foundry operations making small cored pressure castings. Foundry located in industrial New York City. Excellent opportunity for right man. Advise full particulars. Address: Box 505, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

• POSITIONS WANTED

DOES YOUR TOP MANAGEMENT TEAM

need a resourceful, aggressive and intelligent individual with imagination, productivity and integrity plus a diversified gray iron foundry experience. Production and jobbing (up to 20 tons). Engineer graduate with added business education. Journeyman. Middle thirties. Currently earning $11,000. Will go anywhere for challenging position with growth potential.

BOX 471, FOUNDRY
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GENERAL FOREMAN

Twenty-seven years' practical experience in gray iron foundry. Have supervised both jobbing and high production work. Well versed in cupola operation, sand control, gating & rigging patterns. Address: Box 483, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOUNDRY TROUBLE-SHOOTER

Former foreman and superintendent. Thoroughly experienced and expert on sands, facings and gating. Qualified for spot trouble-shooting with gray iron and alloys experience. Desire part time employment. Address: Box 460, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

TECHNICAL FOUNDRYMAN

Acid and Basic cupola and metal control, also sand and casting defects, 20 years' experience, age 49. Will relocate. Address: Box 500, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOUNDRYMAN

Experienced in gray iron and nonferrous metals, mechanization, design, patternmaking, gating, risering, costs. Presently employed as pattern supervisor. Address: Box 468, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

SUPERINTENDENT

30 years' ferrous, nonferrous foundry experience. Nineteen years in top supervisory capacity. Presently employed. Will consider overseas assignment. Address: Box 459, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOUNDRYMAN

With a proven record in large and small, jobbing or production gray iron castings, wants to make change. Will relocate. Address: Box 482, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

PERMANENT MOLD FOUNDRYMAN

Design Engineer, accustomed to production control of quality castings, seeks change to foundry in Northeast Ohio. Address: Box 492, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

CLEANING ROOM FOREMAN

Twenty years' experience in all phases of operations. Gray iron or steel. Large and small castings. Best of references. Address: Box 494, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOUNDRY EXECUTIVE

Desires position in iron or ductile production foundry. Forty-eight years old, college degree and twelve years as foundry and plant superintendent. Consider consulting. Address: Box 473, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

• POSITIONS WANTED

FOREMAN

30 years' experience nonferrous foundry. Industrial, ornamental, architectural, tablet and memorial castings. Green sand, skin dry and French sand molding. Presently employed. Desire change. Address: Box 461, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

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Practical foundryman, nationally known for a job well done. Age 48. Good health. Now employed. Looking for more action ferrous or nonferrous, $15,000 minimum. Address: Box 464, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

MANAGER-SUPERINTENDENT

Practical gray iron foundryman technically trained graduate metallurgist. Thirty years' experience, jobbing, high production producing quality, minimum costs. Wants connection with reliable firm demanding results. Address: Box 476, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

YOUNG PROGRESSIVE FOUNDRYMAN

Desires position presenting challenge and opportunity to advance. Experienced gray iron alloy jobbing and semi-production. Job potential determines locations. Complete resume upon request. Address: Box 498, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

SUPERINTENDENT

Thirty-four years' experience, ferrous and nonferrous practical and technical, twenty years' supervisor. Prefer small shop. Now employed. Age 55. Address: Box 495, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

CAST IRON FOUNDRY SUPERINTENDENT

Age 37. Well experienced in all phases of foundry operations. Duplexing, dielectric ovens, floor and production molding, etc. Presently unemployed. Address: Box 456, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

QUALITY CONTROL MANAGER

A.S.Q.C. Member. 10 years' experience nonferrous foundry and finishing plant. Ornamental and industrial castings. Pattern making, core making, and customer acceptability analysis. Presently employed. Will relocate. Address Box 466, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

QUALITY CONTROL SUPERVISOR

Technical and Statistical Quality Control background in ferrous and nonferrous. Experienced in metallurgy, sand control, gating and risering, customer contact. Able to direct and maintain casting quality. Desires to relocate. Address: Box 488, FOUNDRY, Penton Bldg., Cleveland 13, Ohio

COMPETENT FOUNDRYMAN

Desires change. Will assume full responsibility for medium size jobbing foundry. Prefer Midwest location. Address: Box 481, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOUNDRY SUPERINTENDENT

Twenty-two years in bronze and aluminum jobbing and production shops; journeyman molder; fifteen years in a supervisory capacity. Familiar with all departments including permanent mold. Employed at present. Desirous of locating in New York-Philadelphia vicinity. References furnished upon request. Address: Box 455, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

PRECISION FOUNDRY MANAGER—(U. K.)

Seeks change—Light alloy castings aircraft, commercial. Excellent technical qualifications. Main ability enthusiasm—experience, patterns, models, runners, feeders, Plaster, shell, sand. Address: Box 484, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

MANAGER—SUPERINTENDENT

Twenty-seven years' practical and technical experience in all phases of ferrous and nonferrous jobbing and production foundries, 22 years' top supervisory experience. Good trouble shooter. Results assured. $14,000 minimum. Age 47 now employed. Address: Box 491, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

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Casting Salesman available. New York-New Jersey area. Address: Box 504, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

• POSITIONS WANTED

ESTABLISHED REPRESENTATIVE

With following in Chicago and Northern Illinois area. Desires to represent reliable steel, malleable or nonferrous foundry or any allied lines. College and technically trained. Age 35. Address Box 501, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

MANAGER—SUPERINTENDENT

Graduate metallurgical engineer. Twenty-one years' experience ferrous and nonferrous foundry practice. Cost and quality minded with metallurgical sales experience. Has developed several precision casting processes, both ferrous and nonferrous. Presently employed as foundry technical consultant. Address: Box 502, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

SALES ENGINEER

With following in ferrous and nonferrous industry and casting sales of related products to foundry industry. Last ten years as sales manager of well known foundry supply company. Address: Box 503, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

• REPRESENTATIVES WANTED

SALES REPRESENTATIVE WANTED

For Pittsburgh area to sell foundry materials, refractory quoting, core oils, cold curing and self set binders. Sand control experience and knowledge of foundry sand practice required. Send resume.

THIEM PRODUCTS, INC.
9800 WEST ROGERS ST.
MILWAUKEE 19, WISCONSIN

• CONSULTANTS

FOUNDRY CONSULTANT—NONFERROUS

Sand casting—permanent mold casting—centrifugal castings—in aluminum, brasses, bronzes, 30% leaded bronze—aircraft quality bearings and castings. Address: ED JENKINS, West Palm Beach, Florida. PHONE: TEMPLE 2-8685.

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Specializing in reducing your scrap through sensible gating, intelligent sand control and sound metal practices. Interested parties write. Address: Pat Fleming, 3907 North Harvard, Peoria, Illinois.

• FOUNDRIES FOR SALE

FOUNDRY FOR SALE

Fully equipped now operating gray iron foundry in Western New York State for sale at great sacrifice. Reason for selling, present owners want to retire and settle an estate.

BOX 499, FOUNDRY
PENTON BLDG., CLEVELAND 13, OHIO

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Established 1946 building 55 x 30, lot 109 x 187, completely equipped, large manufacturing accounts, good sales volume, Indiana; with property. Address: Box 477, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

JOBBING GRAY IRON FOUNDRY

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FOR SALE OR LEASE

Nonferrous Foundry. 4500 sq. ft. Now operating.

Building and Equipment located in Chicago.

Death of one owner causes sale.

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National Placement and Procurement of

GENERAL AND PLANT MANAGERS, PLANT SUPERINTENDENTS, FOREMEN—ALL DEPARTMENTS, METALLURGISTS, ENGINEERS, CONTROLLERS, ACCOUNTANTS, SALESMEN, SALES MANAGERS, PERSONNEL DIRECTORS, PURCHASING AGENTS

Confidential Inquiries Invited
From Employers and Qualified Applicants
For Fast Competent Assistance Contact

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JOHN COPE, DIRECTOR, 29 E. MADISON ST., CHICAGO 2, ILL.

JR. FOUNDRY METALLURGIST
$7,200 TO $8,400

Promotable type young man to join rapidly expanding organization that places a great deal of emphasis on engineering proficiency. Client pays fee. Contact Bill Newell in confidence.

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• OPPORTUNITY

PERMANENT MOLD METHOD AVAILABLE THE WAGNER PERMANENT MOLD CO., 2910 Empire Ave., Burbank, California, has developed a Permanent Mold Method for ferrous and nonferrous metals and invites inquiries from any country regarding this method and process.

• WANTED-TO-BUY

WANTED

1000#—2000# capacity Reverberatory Furnace for Iron

Centrifugal Casting Machine to cast up to 10" O.D. x 30" Lg.

BOX 485, FOUNDRY
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WANTED

Shell Mold Machines wanted to handle 14" x 18" and 15" x 20" Molds. Address: Box 489, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

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Used Simpson Intensive Sand Mixers, State size, condition and lowest cash price for immediate acceptance. Address: Box 465, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

• FOR SALE

FOR
IMMEDIATE SALE
INDUCTOTHERM CORP. 50 K.W. INDUCTION MELTING FURNACE PURCHASED NEW AUGUST 1957

50 K.W. 3000 cycle equipped with a 50 lb. tilting furnace. Boque vertical motor generator set. 75 H.P. Motor 440 Volts —3 Phase. G. E. Motor Starter.

Condition Like New!

Capacity—55 lbs. steel in 35 minutes. Now in operation and we will demonstrate in our foundry at your convenience.

Replacement cost of this unit is $17,500 offered at $11,000 for acceptance by October 1.

L. E. JONES COMPANY, INC.
1200—34th AVENUE
MENOMINEE, MICHIGAN
PHONE: UNION 3-2181

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1—125 H.P. Compressor Ingersoll Rand, Model 12 x 6 x 11 ESH, two stage 350 PSIG complete with motor, controls, after cooler. Still in crates. Sacrifice. Address: Castwell Foundry Company, Middletown, New York.

• FOR SALE

FOR SALE

Pangborn 9' LG Table with 8-28" Multi-tables	$4000
Pangborn EN2 Cabinet	$ 275
Wire Cutter ¼"	$ 115
Tabor 10" Molding Machine	$ 75
Tabor Jolt Pin Stripper 10"	$ 250
Flasks 50" x 40", 24" over 12"	$ 50
Flasks 48" x 48" Round	$ 20
Flasks 24" x 15"	$ 10
Pangborn Dust Collector 6000 CFM Complete	$1500
Dust Collector American Sludge 2500 CFM w/5 H.P. Motor Blower	$ 450
Dust Collector Magnesium Sludge Type 5600 CFM 4 stations Newcomb Detroit	$ 400

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426 GRAND STREET
JERSEY CITY 2, NEW JERSEY

FOR SALE

1 Ingersoll Rand Air Hoist, Model B, push-button control, 1000 lb. capacity . . . $225. 1 Ingersoll Rand Air Hoist, Model C, push-button control, 2000 lb. Capacity . . . $325. Address: A & B Foundry, Inc., 835 North Main Street, Franklin, Ohio.

SUPERB BLAST EQUIPMENT

27" x 36" WHEELABRATOR Tumblast w/cloth collector. 1951. Rubber Belt. Beautiful. In operation!
1½ cu. ft. PANGBORN Blastmaster w/cloth collector. Excellent condition.
MOTT and PANGBORN Suction Cabinets—rebuilt.
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SELL—BUY—TRADE
GUARANTEED MACHINES
TERMS: 3 YEARS TO PAY

Specialized Wheelabrators and Pangborns converted to your requirements.

6' LF-14 Pangborn Table	$2200.00
9' LG-14 Pangborn Table	$7000 00
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27 x 36 Wheelabrator Rubber Belt	$3000.00
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6' Wheelabrator Table Room	$6000.00
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Pressure Tanks all types	$150.00 up
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All types and sizes of Hand cabinets, Dust Collectors, Pressure Tanks, Rooms, Horizontal or Vertical Tumbling Barrels and additional Sand Blast Equipment too numerous to mention.

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5634 W. JEFFERSON
DETROIT 9, MICHIGAN
VI 3-6750

• FOR SALE

FOR SALE

One Like-new Electric Arc Furnace Charging Bucket Including Bale
Type: Cable Operated—Clamshell
Capacity: 1486 Cu. Ft. = 55 tons
Max Dia Closed: 17'-9"
Max Dia Opened: 18'-8"
Max Dia Bottom Opening 12'-6"
Distance from Eye of Bale to Bottom of Bucket Opened and Closed: 14'-0"
Weight: 48,000 lbs.

BOX 469, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

FOR SALE
MOTOR-GENERATORS
TRANSFORMERS

Unused—Rebuilt
WORLD'S LARGEST INVENTORY
ELECTRIC EQUIPMENT COMPANY
Phone station Collect GLenwood 3-6783
P. O. Box 51 — Rochester 1, New York

AIR HOIST . . . LIKE NEW

INGERSOLL RAND Model B—1000 Lbs.
List price $655.00. SPECIAL PRICE $275.00
Send for complete 1960 AIR TOOL CATALOG!

U. S. INDUSTRIAL TOOL & SUPPLY CO.
8960 GREENFIELD DETROIT 28, MICHIGAN
PHONE: BROADWAY 3-8318

• FOR SALE

FOR SALE

150 Used Magnesium Fremont Slip Flasks
Good Condition
Priced from $20.00 to $30.00 each
Detailed list available on request.

THE G. & C. FOUNDRY COMPANY
2806 W. MONROE STREET, SANDUSKY, OHIO

REPAIR AND REBUILDING SERVICE ON ALL PNEUMATIC TOOLS

We try to carry a complete line of "Hard Chrome Rebuilt Tools" at about half the cost of new tools. Before you discard your old tools, why not send them to us for our estimate on the cost of refewing them with our Hard Chrome Process?

CENTRAL PNEUMATIC SERVICE, INC.
512 LINDEN AVENUE
DAYTON 3, OHIO
PHONE: CL 2-2701

FOR SALE

One Model 3 Unit Drive Simpson Muller, with Bucket Loader, Double Discharge Hoppers, Mill Belt, Bucket Elevator, National System Aerator, 14 ft. long Prepared Sand Conveyor, 50 ton Sand Storage Bin. All in good condition. Address: Box 480, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

• FOR SALE

FOR SALE

MAGNET (Crane) 29" Diam. Okeh Certification
SPO (Rebuilt) #110-J Jolt Squeeze Portable
TUMBLAST (American) 48" x 72" w/Loader and Dust Collector—far above average
PREPARATOR #60 Beardsley Piper (Complete)
MULLOR #2 Simpson—UD or Open Gear (2 Available)
MOULDERS FRIEND—50" One-Way w/Extra Brush
Other good equipment—for inspection call

W. O. McMAHON
P. O. BOX 5799 HOMEWOOD STATION
BIRMINGHAM 9, ALABAMA
PHONES TREMONT 1-2088 AND 9-6170

FOR SALE

One Model 3F Simpson Mix-Muller, 60 cu. ft. batch, used four years, excellent condition. Address: Box 479, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOR SALE

27" x 36" American Wheelabrator, Serial Number A63376. Only $2450. Address: Weldon F. Stump, 4835 Crestridge, Toledo 13, Ohio.

FOR SALE

1 B & P Mulbaro, with automatic cycling unit and 2 barrows, 2 years old
1 BLYSTONE MIXER, complete, 300# capacity
1 SLY Tumbling Mill, 36 x 60 with Master electric drive and brake

MEECH FOUNDRY, INC.
9906 MEECH AVE. CLEVELAND 5, OHIO
MICHIGAN 1-5556

CLASSIFIED ADVERTISING RATES

(*Effective Jan. 1, 1960*)

POSITION WANTED—Minimum advertisement set solid.
30 words or less $4.00
Additional words .....15c each.

ALL OTHERS—Help Wanted, Employment Service, Wanted-To-Buy, Representatives Wanted, For Sale etc. minimum advertisement set solid,
30 words or less $10.00
Additional words .....35c each.

NOTE: If replies are to be sent to a box number in care of FOUNDRY, add 8 words to your advertisement for box number and address.

Any advertisement set in all capital letters, add 50% to the above rates.

Classified forms close the 13th of month preceding issue.

FOUNDRY
PENTON BUILDING CLEVELAND 13, OHIO

INCH RATES PER INSERTION

Single Column 2¼" Wide	One Time	Three Times	Six Times	Nine Times	Twelve Times
1 inch	$ 27.75	$ 26.25	$ 24.75	$ 24.00	$ 23.25
2 inches	54.00	51.00	48.00	46.50	45.00
3 inches	78.75	74.25	69.75	67.50	65.25
4 inches	102.00	96.00	90.00	87.00	84.00
5 inches	123.75	116.25	108.75	105.00	101.25
6 inches	144.00	135.00	126.00	121.50	117.00
7 inches	162.75	152.25	141.75	136.50	131.25
8 inches	180.00	168.00	156.00	150.00	144.00
9 inches	195.75	182.25	168.75	162.00	155.25
10 inches (1 col.)..	210.00	195.00	180.00	172.50	165.00
15 inches (1/2 page)	303.75	281.25	258.75	247.50	236.25
20 inches (2/3 page)	390.00	360.00	330.00	315.00	300.00
30 inches (1 page)	562.50	517.50	472.50	450.00	427.50

Remittance should accompany advertisement when submitted —Cash Discount 2%, 10 days.

- Rates are based on total space used during one year.
- Copy: Use of cuts and display type permitted on units of space one-third page or larger only. Any necessary copy preparation, art work and engravings to be paid for by advertiser. All copy subject to approval of publisher
- Color Available on FULL Pages only. $90.00 per page. Effective with September 1960 issue.

Two *OUTSTANDING VALUES* from UNIVERSAL

BLAST CLEANING UNIT

96" WHEELABRATOR SWING TABLE

Capable of handling work 96" in diameter. 42" work height clearance, 10,000 lb. loads.

LIKE NEW CONDITION—SEE IN OPERATION.

Less Than Half of Today's Replacement Value.

SAND HANDLING SYSTEM

NATIONAL ENGINEERING UNIT

Consisting of: NO. 1½ Simpson U.D. Muller with water meter, National Screen Master Preparator, Skip bucket loaders, 20" x 20' belt conveyor, "Elevayor", 2 Moulder's hoppers.

1957 unit in LIKE NEW CONDITION
Dismantled in our warehouse
Yours for Less than Half of today's replacement value!

PARTIAL LISTING OF OUR REGULAR REBUILT MACHINERY STOCK

AIR COMPRESSORS
1—15 hp WESTINGHOUSE air cooled, 2 stage
1—75 hp INGERSOLL-RAND water cooled, horizontal
1—100 hp WORTHINGTON air cooled, 2 stage

BLOWERS
25—CENTRIFUGAL 16 oz., 2 to 5 HP
10—GE, WILBRAHAM - GREEN, FISHER Positive Pressure & Cent, Cupola Blowers

CLEANING EQUIPMENT & TUMBLING BARRELS
1—15" Cont. WHEELABRATOR Tumblast
1—26" Cont. WHEELABRATOR Tumblast
1—20" x 27" WHEELABRATOR Tumblast
1—27" x 36" WHEELABRATOR Tumblast
1—36" x 42" WHEELABRATOR Tumblast
1—48" x 42" WHEELABRATOR Tumblast
1—48" x 48" WHEELABRATOR Tumblast
1—48" WHEELABRATOR Swing Table
1—96" WHEELABRATOR Swing Table
1—1-A WHEELABRATOR Multi-table
1—WHEELABRATOR Peening Cabinet
1—WHEELABRATOR "K" Pressure Cabinet
1—PANGBORN TABLAST, 8' Table
1—PANGBORN Air Blast Room
1—PANGBORN PIPE CLEANING CABINET
1—SLY, 68" x 32" Round
4—SLY, 48" x 36" Round
1—Model 43 LIQUAMATTE Wet Blasting Cabinet
1—WHEELABRATOR Sheet Cleaning Machine, 48" wide stock

CONVEYORS
1—HEWITT-ROBINS Oscillating, 18" W x 40' L
1—HEWITT-ROBINS Vibrating, 18" W x 10' L, Model VC-1
1—LINK-BELT, CAR type mold, 114 cars, 403' track, car size 18" x 42"
1—SIMPLICITY, 24" x 10" Feeder w/hopper, Model OA-10-JA2

CORE BLOWERS
10—DEMMLER #1, #2, #2A, #3K, #4E
3—INTERNATIONAL SB-13
3—OSBORN #91, #192, #91-10
1—RANDALL MODEL "A," Bench Type
1—SAN-BLO #40-P-1, 40# core
1—TACCONE #4D, 10" Draw Stroke Cyl.

DUST COLLECTORS
COMPLETE STOCK—both Wet & Bag Types

FURNACES—DIRECT ARC MELTING
1—250 lb. LECTROMELT, Side Charge
1—500 lb. LECTROMELT, 200 KVA trans.
1—1000 lb. SWINDELL
1—2000 lb. HEROULT
1—2000 lb. SWINDELL, 3/60 1000 KVA.
1—1½ Ton HEROULT
1—11' LECTROMELT Top Charge
1—12' SWINDELL Hyd. Top Charge
1—10' Top Charge Furnace

FURNACES—INDIRECT ARC
1—10# DETROIT
1—350# DETROIT LFA
1—750# DETROIT LFY, Conical Shell
1—1000# DETROIT AAD P, 300 KVA
1—3000# DETROIT C, 500 KVA

FURNACES—INDUCTION MELTING & HEATING
1—30 KW ECCO Hi-freq. Vacuum Melting
1—35 KVA AJAX 60 cy., alum.
1—35 KVA, AJAX SPARK GAP, High Freq., steel
1—30 KW LEPEL, water cooled spark gap

FURNACES—GAS & OIL
1—1000# HAUSFELD hand tilt, Oil fired, alum or magnesium
1—1 #900 JC STROMAN, gas. Like new
1—6000# STROMAN, gas fired

FURNACES—HEAT TREAT
1—4' x 4' x 10' Gas Fired Annealing
1—9' x 12' Car Type, gas/oil
1—210 KW LINDBERG conveyor box type
1—7' Rotary G.E., 200 KW, 1950° F
1—36" x 36" WESTINGHOUSE Pit Type.
1—10" x 12" x 24" LINDBERG, 2500° F. Hydrogen

MOLDING MACHINES
Jolt Rollover Pattern Draw
2—DAVENPORT #345A w/air clamps, 34" x 48" table, 2500#
2—DAVENPORT #408A, 40" x 60" table, 3000#
1—HERMAN 10,000#, 48" x 109" table
1—HERMAN 6000#, 42" x 78"
2—HERMAN 7500#, 40" x 50" tables
1—HERMAN 7500#, 40" x 60" table
1—HERMAN 3000#, 30" x 66" table
1—HERMAN 3000#, 32" x 70", 15" cyl. series charging conveyor type
5—HERMAN 1500# to 30" x 48" tables
1—INTERNATIONAL 30" x 12", Type G, 28" x 35" table
2—INTERNATIONAL, 13" x 17" tables
1—J&J #918, 40" x 48" table, 18" draw
1—J&J #612RP, 24" x 30" table, 12" draw
1—OSBORN #602, 36" x 26", 900#
1—OSBORN #405, 3000#, flask 64" x 57"
4—TABOR 40" x 60", 1500 & 3000#
2—TABOR 30" x 40" w/air clamps, 1000#
1—TABOR 22" x 42", pattern draw, shockless, portable, 600#
1—TABOR 20" x 30", w/air clamps, 1000#
2—TABOR 14" x 16" Rockover 150#
1—TABOR 40" x 50" table, 3000# capacity

Plain Jolt
1—INTERNATIONAL, 3' x 4' table, 12" cylinder
1—TABOR 3' x 4' table

Jolt Pin Lift
1—HERMAN #4317, 22" x 30" table
2—INTERNATIONAL JDP, 1200 x 8", 24" x 26" table, 8" draw, 1200#, port.
2—SPO #305, 750 lb., 20" x 27" table
1—TABOR 20" x 24" table, 600#

Jolt Squeeze Pin Lift
2—INTERNATIONAL PKL, 20" x 28" table, 14" sq., 5½" draw
2—INTERNATIONAL PKL, 18" x 24" table, 12" sq., 5½" draw, stat.
2—MILWAUKEE #163, 15" x 24" table, 11" sq., 1500#
1—NICHOLLS 18-44, 6½" draw.
5—OSBORN #712J, #712PJ, 18" x 28" table. 12" sq., 6" draw, stat. & port.
2—OSBORN #716PJ, 22" x 34" table, 16" sq., 8" draw.
5—SPO #2114P, 21" x 27" table, 600#
2—SPO #2116, 21" x 27" table, 11" sq., 6" draw

Jolt Squeezers
2—INTERNATIONAL #12 LJS, 16" x 20"
4—INTERNATIONAL #10 LJS, 16" x 20"
10—OSBORN #275J, 16 x 20" table, 400#
3—TABOR Squeeze-in Head, 16" x 19" table
1—TABOR Yoke Type, 18" x 26" table

MATERIALS HANDLING
1—BYERS, Mobile Crane, BUDA Engine, 50' Boom, 5 ton w/magnet & bucket
1—HOUGH PAYLOADER, Model HA, 1000# cap., hyd. lift, mech. dump

MULLERS AND MIXERS
1—B&P #30 Speedmuller w/skip, 3 cu. ft.
1—B&P #40 Speedmuller w/skip, 5 cu. ft.
1—B&P #50 Speedmuller with cooling & multro-matic controls, 7½ cu. ft.
1—B & P, Conventional, SIMPSON type, 87½" Dia. arranged for cooling
1—SIMPSON #0, U.D., 3' Dia.
1—SIMPSON #1, U.D., 4' dia., 4 cu. ft.
1—SIMPSON #1½, U.D., 4'6" dia., 6 cu. ft.
1—SIMPSON #1½, Sep. Dr., 4'6" dia., 6 cu. ft.
2—SIMPSON #3, 8' Dia. Sep. Dr., 20-25 Cu. Ft. Batch

LADLES
Bottom Pour
4—MODERN, 49" x 49"
2—MODERN Crane Type, 55" H x 50" top
1—MODERN Crane Type, 60" H x 60" top

Lip Pour
1—WHITING 52" x 52" top dia. geared

Cylindrical
8—WHITING, 26" L x 22" dia, 1100# iron
7—WHITING, 19" L x 22" dia, 600# iron
3—WHITING, 38" L x 28" dia, 2200# iron

OVENS
1—COLEMAN, Gas, 2 Comp. and 5 drawers, O.D. 22" x 12' x 10'
3—GENRICH, Elec. elevator type.
1—LANLY, elec. 5'11" x 3'2" x 7'3" H

SAND CONDITIONING
1—AMERICAN Sand Cutter, Model AA, 62" cutting reel
1—B & P Nite-Gang
2—B&P Screenarator, Model "M"
1—LINK-BELT Revivifier
1—MOULDER'S FRIEND, 50" cutting reel
1—ROYER Jr., 7-10 tons/hr., ½ Hp
2—ROYER, NC-2, 10-15 tons/hr, 1½ HP
1—ROYER NC-4, 10-15 tons/hr. 1½ Hp
1—ROYER PREPARATOR, Comb. Model NDC, 25 ton/hr scrap removal, 8' x 8' hopper
3—ROYERS, NDP, 15-25 tons/hr, 2 Hp
1—SIMPLICITY Type SOBG, 4' x 5' screen
6—SIMPLICITY Shakeouts, 3'x10', 4'x8', 4'x10', 5'x8'

SAND SLINGERS
1—B&P Stationary, 2 speed, 19" head, 4" tip with plate feeder
1—B&P Stationary, Single Speed
2—B&P Tractor Type, 16" head
1—B & P Tractor Type 19" head

MISCELLANEOUS
1—BLASTCRETE Model PM-1 Cupola Gun
1—KANE & ROACH WIRE STRAIGHTENER Model DX-5
FLASKS, CORE PLATES, All Sizes
1—CLIMAX Model 2-A Wire Straightener 10 or 15 HP GRINDERS, Swing Frame
8—GRINDERS, Double End, Pedestal Type, U. S., Cin., Gardner, 5, 7½ & 10 HP
1—62" Magnet
14—MOULDER's Hoppers, various sizes

UNIVERSAL MACHINERY AND EQUIPMENT CO.

1632 N. Ninth St., Reading, Pa. Phone: FRanklin 3-5103

Send for Our Illustrated Catalog

EUCLID FOUNDRY & MACHINE EQUIPMENT CO.

14919 SARANAC ROAD — CLEVELAND 10, OHIO

WHEELABRATORS
3—6 cu. ft. Continuous Tumblast
1—42" x 48", 17½ cu. ft. Tumblast with loader
1—36" x 42", 11½ cu. ft. Tumblast
1—6' Table Airblast w/six aux. tables
2—6' Table Pangborn LF and LE

MULLERS
Simpsons #1, 1½, 2, 3, unit drive
Clearfield #404, 610
Beardsley-Piper #40, 50

LADLES-WHITING
4—25 Tons
2—15 Tons
2—10 Tons

CORE OVEN
1—Di-Electric Model M800-A
Thermonic, 30 KW

SANDSLINGERS
1—B-P 22" head stationary, R&L arm
1—B-P 19" head stationary, double belt
1—B-P 19" stationary, riddle type

WANTED!
COMPLETE FOUNDRIES,
SMALL/LARGE.
PROMPT SERVICE.

— **GLENVILLE 1-1222**

Circle 867 on Page 45

...a trademark to remember...a name to trust...

FOUNDRY ENGINEERING SERVICE — HN — FOUNDRY EQUIPMENT BY FOUNDRYMEN

HAMLIN-NAGEL, INC.

Box 192, EDWARDSVILLE, ILLINOIS, *In Metropolitan St. Louis*, PHONE 3864

AIR COMPRESSORS
15, 25, 30, 40, & 100 HP water cooled, horizontal
175 hp Synchronous, 2 state IR-XRE

AIRLESS BLAST EQUIPMENT

Wheelabrator 48 x 72 with skip and dust collector, excellent condition.
American 66" Swing Table, 48 x 48 with skip Hoist

Wheelabrator 27 x 36 with skip
Wheelabrator 42 x 48 with skip & collector
Wheelabrator 36 x 42 with skip & collector
Pangborn #3 continuous with feeder & collector
Dust Collectors, various sizes
Air Blasting Rooms, complete or component parts

CORE BLOWERS
Demmler 103EO, skip feeder & automatic cycle
Demmler 3EO, feeder & semi-automatic cycle
Demmler #1 and #2, #55 and 2K
Champion CB-8 and CB-15 and CB-18
Redford #1 and 2
San Bio CB-40-D-LPP

Complete CO_2 Unit-Shooter, Gasser, w/Tanks & Mixer

CORE OVENS
Coleman 39' tower combination Oil & Gas
F. E. Portable Mold Drying Oven
Large F. E. Mold Drying Oven
Large Porbeck Mold Drying Oven
Porbeck double end Gas or Oil
Porbeck single end Gas or Oil

HEAT TREATING
Lindberg Super Cyclone
Gas Fired 45" Dia x 60"
G.E. 30" Dia x 36" Single Phase Electrics

JOLT PIN LIFT
J & J 688 24 x 30 table
Davenport 34A, 36 x 46 Table
Milwaukee 1536, 32 x 38 Table
Plain Jolters, 72 x 72 Table, Cap. 8500#
Plain Stripper—15,000# Capacity

JOLT SQUEEZE PIN LIFT
International PKL14, 24" x 24" Table
International PK18, 24" x 36" Table
Milwaukee 125, 21" x 27" Table
Milwaukee 126, 21" x 27" Table
Milwaukee 145, 24" x 30" Table
Milwaukee 193, 19" x 32" Table
Osborn 712PJ, 15" x 26" Table

SPO 2192 (auto-cycle), 34" x 42" Table

JOLT ROLLOVER DRAW
Herman 40" x 60"—10,000#
International F 16" Draw, 28" x 52" Table
International G 30 x 12, 28" x 38" Table
J&J 918, 44" x 54" Table
J&J 612, 24" x 30" Table
SPO 508, 28" x 30" Table
Tabor 30" x 40" Table
J&J 815, 30" x 40" Table

JOLT SQUEEZE ROLLOVER DRAW
Osborn 332, 20" x 36" Table
SPO 920, 20" sq. cyl, 20" x 44" Table
SPO 413D, 24" x 24" Table

SPO 9546, 24" x 30" Table

JOLT SQUEEZERS
International PJS-16"
International LJS-10"
International LJS-12"
Milwaukee 103
Osborn 275J and JW
SPO 110J
Tabor Top Squeezers
Champion JS, 10"

MATERIAL HANDLING
Hough HA Payloaders, Forklifts 4000#, 6000#, 7000#, Handling Boxes.
Roura Hoppers
1½ Yard D.C. Clam Shell
½ and 1 Yard Clamshell Buckets
Hoists, Air and Electric, All Sizes
Champion CB-8 and CB-15 & CB-18
Crane Magnets 50", 55"

MELTING FERROUS & NONFERROUS
Cupolas 2½, 4, 6, 8, 9, 10
Cupola Blowers, Various Sizes
Cupola Chargers, Skip & Swivel
Foxboro Air Wt. Controllers
Bondactor Mod. 1000
Crucible Furnaces (Stat & Tilt)
Dip Out Reverberatory
Lindberg Induction, 150#

METAL HANDLING
Ladles 250#—20,000#
Pouring Devices, various capacities
Motorized Ladle Carrier
12" Cleveland Tramrail

MULLERS

Simpson #3F complete with skip, auto-cycle, cooling hood, etc.
Simpson #1UD, skip, hood, auto-cycle
Simpson #1½ UD, Skip, Hood
Simpson #3 open gear with skip
Simpson #2 open gear with skip
B&P #60—W or W/O multromatic
B&P #50A—with skip, multiroll, hood
B&P #30 with skip and hood
Simpson Porto Muller
B&P Mulbaro
610 Clearfield

SAND HANDLING & CONDITIONING
Complete Overhead Sand Systems
Screenarator 8, M, L
Royer NDP-NC2, Junior
American Sand Cutters, Various Sizes
Bucket Elevators
Troughing Conveyor 18" x 34' w or w/o magnetic pulley
Oscillating Conveyor 24" x 30'
B&P No. 40 and 60 Preparators
Magnetic Pulleys 12 x 18 and 14 x 16

MISCELLANEOUS EQUIPMENT
Sprue Cutter
Grinders, 18" x 24", UB No. 65, Marshke, Bridgeport
Flasks, Steel, various sizes
Flasks, Aluminum Slip
Flasks, Fremont Magnesium Slip
Jackets, Aluminum & Wopper Jaw
Core Plates—Aluminum & Transite
American Core Rod Straightener
15 HP Swing Grinder
Tumbling Barrels 36" x 72", Whiting, Sly
458 Chain & Trolleys
Chemical & Physical Labs
42" Bullard "New Era" VTL lathe with side head
52" Betts Boring Mill with two loading arms, late
American Radial Drill 14" x 7' arm
Cincinnati 2F Milling Machine, late

Send your requirements; our stock changes daily. WANTED! Good Surplus Equipment

Circle 868 on Page 45

THE ACME bargain page

AERATOR
NEWAYGO

BLOWERS
I.-R. 12900 cfm, 100 h.p. 220-440 V, 20 oz.
GE 10500 cfm., 20 oz., 85 h.p., 220 V.
GE 7500 cfm., 20 oz., 89.6 h.p., 220-440 V.
SPENCER 7350 cfm., 16 oz., 50 h.p.
SPENCER 7000 cfm., 32 oz.
GE Centrifugal 6200 cfm., 24 oz., 58 h.p.
6000 cfm. INGERSOLL-RAND 32 oz.
SPENCER 3500 cfm, 28 oz., 40 h.p.
SPENCER 2250 cfm., 16 oz., 15 h.p., 220
SPENCER 1350 cfm, 32 oz.
NORTH AMERICAN 1050 cfm, 16 oz.
NORTH AMERICAN 850 cfm.
500 cfm. NORTH AMERICAN 12 oz.
McKee 200 cfm.

CONVEYOR
17' BARBER GREEN Bucket Conveyor
30" x 25' Magnetic Belt Conveyor w/drives, 2 hp., 220-440 V.
24" x 18' Trough Perm. Magnetic

CONVEYORS, OSCILLATING
24" x 40' Ajax
SIMPLICITY 18" x 24'
SYNTRON 24" x 6'
AJAX 12" x 20'6"
36" x 11', Ajax
8" x 13' Ajax

CORE BLOWERS
CB15 55# cores, Universal blow plate
DEMMLER #4 up to 250# cores
DEMMLER #50
DEMMLER 2EO
DEMMLER 2K
FEDERAL "SAN-BLO" CB 40
INTERNATIONAL SB15H, up to 150# cores. Hydraulic clamp and draw
INTERNATIONAL SB 13, up to 60# cores
6—OSBORN 193 up to 50# cores
REDFORD #2 & #4

CORE GRINDERS
5—MILWAUKEE 70-9 & 70-12s
1—OWOSSO DE1-393 42" table

CORE OVENS
THERMONIC INDUCTION MODEL 1800A
2—Despatch ET. Drawer Type

CORE ROLLOVERS
INTERNATIONAL REDP Rollover 12" draw
SUTTER #500

CRANES
P&H 5 TON Electric Traveling DC motors 50' span
270' Crane Runway and Supports
10 ton MILWAUKEE; 48' span, 220 V.

CUPOLA GUNS
1—Bondactor #1250 and 1000

DUST COLLECTORS
PARSONS 40,000 cfm. cloth bag type
ROTOCLONE W14 Arrang. A. 5200 cfm.

ELECTRIC MELTING FURNACES
1—DETROIT "LFA" 350# shell 13200 V.
1—DETROIT "LFC" 700# and 350# Tapered Shell 2300 V.

FURNACES
400# Fisher Motorized Tilt, Gas Fired
600# Fisher Stationary
600# Campbell Hausfeld Brass
ECLIPSE 2000# Skelnar Gas, cast iron, or alum.

GRINDERS, MISC.
U.S. #70 Comb. 20" disc & 20"x3"x1½" wh
GARDNER 18" single end disc.
HANCHETT 30" double spindle opposed
GARDNER 26" D.E. Disc
120A Gardner 30" Opposed Disc
Porter Cable BG 8 8" belt
72" Gardner Horizontal Disc
53" Hanchett Horizontal Disc.

GRINDERS, SNAG
Marschke 30" x 3", 3 speed snag
U. S. D.E., 20" x 3" Wheel, 15 h.p.
5—#6 FOX Single Wheel 24" Snag
U.S. #65 D.E. 30" x 3" x 12"
STANDARD 24 x 2½—15 HP DE Snag

GRINDERS, SWING FRAME
FOX 24" x 3" x 12", 15 h.p.
MARSCHKE 24" x 3" x 12" 20 h.p., 220 V.
U.S. 24" x 3" x 12" 15 h.p., 220-440 V.
2—MARSCHKE 3 h.p., 12" wheel
1—B&D 7½ h.p.

CUTOFF SAWS
DEWALT CUTOFF SAWS for ferrous or nonferrous metals, cutoff or as sprue cutters. Flush blade adaptor takes up to 20" abrasive blade or saw. Power Hoist to arm. Chain & sprocket cross feed for working on heavy cast iron 48" x 60" "T" slot table or off table cutting of large work. Motor swivels horizontal to vertical in yoke.

HEAT TREATING FURNACES
G. E. ELEVATOR Type 1950° Atmosphere Generator 65" x 16' car. Electric, Late
G. E. Elevator type 2150°—96" x 144" car atmosphere generator, Electric, Late
LINDBERG 1250° 48 x 60 Electric
3—ABBOTT 24" H x 22" Deep x 30" Wide, Gas Fired
HOLDEN #202 1850° Bright Hardening Annealing
25 KW Westinghouse 2000°

HOISTS
6000# Cleveland, w/monotractor travel
6000# Electrolift
4000# Cleveland
4000# Ingersoll-Rand Air
2—4000# Lo Hed, 220/440 V.
4—2000# R & M
4—2000# Ingersoll-Rand Hoists
4—CLEVELAND 2000# Cab type hot metal carriers
1—500# Ingersoll-Rand LC-4
180' Cleveland 12" Rail

INDUCTION MELTING EQUIPMENT
100 KW-Ajax 300# 3000 cycle, 150 h.p. 4 bearings MS set, water cooled, complete controls
30 KW Lepel Spark Gap
35 KW Ajax Tama Wyatt, 60 cycle induction holding furnaces
1000# Ajax Spare Melting Furnaces

LADLES
WHITING 16000# Crane
WHITING 8000# Crane
WHITING 5000# Crane
4000# Industrial Holding

MOLD BLOWER
TACCONE TD4 24" x 32" flask

MOLD CONVEYOR
366'—51—44" x 66" cars

MOLDING MACHINES JOLT SQUEEZE PIN LIFT
8—OSBORN 712 PJ 18" x 28" table
1—CHAMPION JSL10P 18" x 21" table 6" draw
8—MILWAUKEE 2646 Jolt Squeeze Strip rolloff — rolling molding machines 10" jolt cylinder; 1800# capacity, 26" Squeeze cylinder; 13" draw, Flask size 25½" to 29" wide, 52" long. FACTORY REBUILT.
2—MILWAUKEE 165, 24" x 30", 8" draw

JOLT SQUEEZERS
4—CHAMPION, JS10P 18" x 21" table
2—OSBORN 275PJ
2—MILWAUKEE 244 Jolt Squeeze car type head
MILWAUKEE 181-7, 24" x 36" table
113 PJ SPO
25—124 Milwaukee Portable Jolt Sq.
6—104 Milwaukee Portable Jolt Sq.

JOLT ROLLOVER DRAWS
HERMAN 10000# late
HERMAN 3000#
2—750# HERMAN 20" x 30" table
1—INTERNATIONAL RJ 20" x 12"
1—SPO 9032
3—SPO 506
1—SPO 506 SP
2—INTERNATIONAL G
2—TABOR 30 x 52

JOLT SQUEEZE ROLLOVER DRAW
OSBORN 331-332-333
SPO 413D
INTERNATIONAL RES.

PLAIN JOLT
40" x 84" Herman
36" x 60" Herman
2—20" x 30" INTERNATIONAL

MULLERS and MIXERS
#80 B&P
#30 B & P w/skip loader
2—#3 UD Simpson
1—930 Clearfield
CLEARFIELD #404
4—#2 SIMPSON OG
#1 Simpson OG

SAND CONDITIONERS
AMERICAN 51"
JEFFREY SANDITIONER
ROYER NDC—ND2
SCREENARATORS S-M-L

SAND SLINGERS & EQUIPMENT
3—19"—2 speed Stationary
2—14' Turntables
1—12' Turntable
1—8' Newaygo Plate Feeder
4—7' B & P Plate Feeders

SAND SYSTEM EQUIPMENT
2—18" x 52' Magnetic Belt
40 Ton Sand Hopper
33' Bucket Elevator
28' Bucket Elevator

SAWS, BAND
30" LAIDLAW, Metal Cutting hydraulic

SHAKEOUTS
3' x 5' SIMPLICITY
3' x 10' SIMPLICITY
5 x 10 LINK-BELT
4 x 8 LINK-BELT
2' x 8' Double Deck

SHELL EQUIPMENT
SHELL PRODUCTS 20" x 30" pattern size w/shell blender and bonding press
TSM4 Shell Molding Machine 20" x 30"

SHOT BLAST
SLY #4, 20" x 30" w/dust collector

SLAG DISPOSAL UNIT
AMERICAN MODEL A

SPRUE CUTTERS
1—MILWAUKEE #85 TON

STRAIGHTENING PRESS HYDRAULIC
225 ton Southwark
150 ton HPM
150 ton Farquhar "C" Frame
100 ton Elmes Hydraulic
100 ton Hannifin Hydraulic
100 ton Watson Stillman "C" Frame
60 ton Lempco 4 post
60 ton Farquhar "C" Frame
25 ton Fox
25 ton Dennison

TESTING EQUIPMENT
120,000# Baldwin Hamilton Tensile

ARLIN Automatic Rockwell, continuous
COLEMAN 55 Spectrophotometer
GOGAN Model 1414-2V
TINIUS OLSON Brinnel Hardness Tester Production Bench

TUMBLING BARRELS
1—ROYERSFORD, 42" x 72", chain drive
SLY, 24" x 48"; 3 H.P.
SLY, 30" x 60" Duplex.

TUMBLING MILLS
30" x 60"

WHEELABRATORS
27" x 36" American w/skip
48" x 48" AMERICAN w/skip
6' Table PANGBORN
#1 Rotary Table, AMERICAN
20" x 27" AMERICAN, w/rubber belt
AMERICAN #2 Tablast 8-28" tables, late
PANGBORN GD1-Airblast Barrel

WOODWORKING—PATTERNSHOP
HERMANCE 24" Planer
JONES SUPERIOR 48" Double Disc
OLIVER #290 Dbl Arbor, Tilt-Arbor Saw
1—OLIVER 182D, 15" Disc Sanders
WALLACE 8" Jointer
CRESCENT 24" Planer
ONSRUD W-244 & W-240 Routers
8", 12" and 30" Jointers

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EXCEPTIONALLY POPULAR ITEMS AT REALISTIC PRICES

SAND MULLERS

2—BEARDSLEY & PIPER, Speedmullors, Model 80. Cap.--24 cu. ft. Pan diameter 8'-6". W/air operated batch hopper, water meter, dust hood, 15 HP Clarage cooling fan, Multramatic control, 125 HP Motor. Serial #80-61 & 80-60.
4—SIMPSON Sand Mullers, Model 3½-UD. Pan diameter 9'-3", crib depth 42". Unit Drive. Muller wheels 5500# weight, 45" diameter, 13" face. Capacity 45 to 50 cu. ft., 75-ton per hour. With 75 HP.

3—B & P No. 80 Speed Muller—24 cu. ft. air cooled.
1—B&P #30 Speedmullor, 4 cu. ft., w/skip Hoist Loader—Air Cooled.
1—B&P #60 Speedmullor, 12 cu. ft., w/skip Hoist Loader—Air Cooled.
1—B & P #70 Speedmullor, 18 cu. ft. w/loader.
1—BESSER Paddle Type, 30 cu. ft.
2—CLEARFIELD No. 610 w/skip hoist loaders, 10 to 14 cu. ft. batch.
1—CLEARFIELD #404, 4 cu. ft. batch.
1—DRAVO-DOYLE 6 cu. ft. cap. Port.
1—LINK-BELT 48" x 8' Paddle Type.
2—MASTER 300# Sheil Type 5' pan dia.
1—SIMPSON #1-H Style UD, 400# batch.
2—SIMPSON #1½ style UD, 700# w/loader.
2—SIMPSON #2, Style C, 1500# w/loader.
3—SIMPSON #3, Style C, 3000 lb.
3—SIMPSON #3, Style UD, 3000 lb.
2—Mixer Muller, 6 cu ft paddle type.
1—LANCASTER No. EDG-4, 5 cu. ft.
1—LANCASTER #EA-4, 6 cu. ft. w/loader.

AIR & ELECTRIC HOISTS

85—I & R Air Motor type, sizes A, B, C, D, D-6 & E. ½, 1, 2, 3 & 5 ton.
15—DETROIT Air Hoists, 1, 1½, 5 ton cap.
1—DETROIT Model LHR, 5 ton, elec.
20—THOR air hoists. ½, 1 & 2 ton cap.

BUCKET ELEVATORS

12—LINK-BELT & JEFFREY, 30, 40, 50, 60 ft. ce. 10 x 7, 12 x 7, 14 x 7, 16 x 8 buckets.

CUT-OFF MACHINES

1—TABOR C10AF, 16" wheel, 10 HP.
3—TESSEMER H & I Sprue Cutters.

CORE BLOWERS

3—CHAMPION Model CB-10, CB-18, & CB-400. From 10 to 300 lb. Cores.
22—DEMMLER #50 Model 1, 1E, 2, 2E, 2K, 3, 3E, 3K, 4 & 4E, 10 to 100 lb.
1—FEDERAL 40P-1 San-Blo.
7—INTERNATIONAL Model SB-11 & SB-13, SB-15H, 15 to 30 lb. Cores.
6—OSBORN Nos. 91, 92, 192 and 193. From 10 lb. to 75 lb. Cores.
2—REDFORD #2—Magazine type.
1—SAN-BLO Model CB-40-B, 40# Cores.
1—SPO Model SC-10-DM, hollow core.

CORE OVENS

1—INDUSTRIAL "Revolving Carriers" continuous, 18" x 80" trays.
1—DESPATCH Type "S" 6' w x 16½' l x 7½' h Oil Fired.
1—THERMONIC Model M800A Dielectric. Cap. 900#s per hour.

CUPOLAS, BLOWERS & EQUIP.

1—SPENCER 150 HP 7500 CFM 48 oz.
6—I & R Centrifugal 30, 50, 85 and 100 HP. 3500 to 10,500 CFM w/blast gates.
1—CUPOLA Bondactor, style 1205-L.

ROTO-CLONES WET TYPE

9—AMERICAN AIR FILTER Type N&W. Sizes No. 20, 24, 27, & No. 30, w/sludge ejectors, cap. to 30,000 CFM.

ELECTRIC MELTING FURNACES

4—DETROIT LFA, 350# Cold Charge 700# Molten w/200 KVA transformers.
1—TOCCO 20 KW Induction, 9600 cycles.
3—AJAX No. 100 & 300 Furnaces Only.
6—AJAX 35 KW Induction 460 V 1 phase.
1—DETROIT Size CM-—4000# Charge, 8000# Molten. w/1000 KVA trans.
2—AJAX 20 KW Hi Frequency Converters.

GAS & OIL FIRED FURNACES

23—LINDBERG FISHER Model MNP electric Tilt. Sizes 150, 400, 600, 1000, 1700, 2000 & 2400#, alum. cap. Gas or Oil.
29—LINDBERG & HAUSFELD Stationary, Sizes 100, 150, 200 & 550 cap.
1—SKLEENAR 1200# Rev., hand tilt.
1—MONARCH 600# Rev., hand tilt.
1—STROMAN, "U" 600# Reverb.
1—STROMAN DC "Dipout" 800# cap.
1—ECLIPSE E1000—Double Chamber Dry Hearth 1000# cap.

GRINDERS

Swing Frame

1—FOX #4 Wheel 24" x 3"—20 HP.
1—MARSCHKE 20" x 10" wheel, 10 HP.
3—MARSCHKE 24" x 3" wheel, 15 HP.
1—U. S. ELEC. Model 24, wheel 24" x 3".
1—MUMMERT-DIXON #2420, wheel 24".

Snagging

4—FOX #7—30" x 3" Wheel, 15 HP.
2—U. S. #64, 20" x 3", 7½ HP, 4 speed.
2—SAFETY #174, 24" x 3" wheel, 10 HP.
2—MARSCHKE 24" x 4" wheel, 20 HP.
1—U. S. #65, 30" x 3", 15 HP, 4 Speed.
U. S. No. 62VS, 24" wheel, 2-7½ HP motor, variable speed.

Core

2—MILWAUKEE 70-12, 70" dia. table.
1—STONEY Core Grinder, 16" dia. Wheel.

Horizontal Disc

GARDNER No. 124—53" wheel, 20 HP.
GARDNER No. 149, 70" dia. wheel, 40 HP.

LADLES

17—MODERN & WHITING Cylindrical Ladles, 215, 2450 & 3000 lbs. capacity.
37—MODERN & WHITING Lip Pour, Enclosed Gear, 1200, 1600, 2000, 4000, 6000, 7000, 8000 lbs. capacity.
7—MODERN & WHITING Mixing Ladles, 2 & 3 ton. Electric & Manual Tilting.

MOLDING MACHINES

Jolt Squeezers

12—OSBORN No. 270-J—17x20 Table, 10".
2—OSBORN No. 216-PJ—21x32 Table, 16".
6—MILWAUKEE 1.3—17x26 Table, 12".
2—MILWAUKEE 184—24x36 Table, 18".
10—INT. PVJS—20x26 Table, 12" cyl.
9—SPO No. 110-J—1.x 26" Table, 10".
8—SPO No. 113-J—17" x 26" Table, 13".

Plain Jolt

1—J&J 50" x 72" table—5000# cap.
2—OSBORN 60" x 72" table 6000# cap.
1—TABOR 36" x 36" table. 1000# cap.

Jolt Rollover Pattern Draw

1—DAVENPORT 28-SA, 29" x 40" table.
2—HERMAN 20" x 30"—450# series.
2—HERMAN 26" x 48"—1000# series.
2—HERMAN 50" x 60"—300# series.
2—HERMAN 40" x 48"—400# series.
1—HERMAN 60" x 84"—6000# series.
1—HERMAN 60" x 84"—10,000# series.
14—INTERNATIONAL TYPE G., Size 20" x 8", 24" x 10", and 30" x 8".
1—J & J #920 RC—44" x 54"—Hyd. head.
2—J & J #612, 24" x 30" Table.
4—J & J #918, 44" x 54" Table.
1—J & J #815-B, 30" x 40" Table.
1—MILWAUKEE #167, 32" x 33" Table.
10—OSBORN #40 and 42 Core Rollovers.
1—OSBORN #442, 21" x 31" Table.
2—OSBORN #242W, 29" x 42" Table.
12—OSBORN #601 & 602, 30" x 36" Wide Flask, 10" draw, 750 lbs Cap.
2—OSBORN 643 Table 35" x 50"—2000#.
1—SPO No. 917-A—40" x 29" Table.
1—SPO #413D, 24" x 25" Table.
1—SPO Model 508, table size 28" x 30".
1—SPO 5050, Table 2o" x 30", 10" draw.
3—TABOR 30" x 40" Table, 12" Draw.
4—TABOR 22" x 42" table, 10" Draw.

Jolt Pin Lift

2—DAVENPORT #34 AJS—36" x 46" Table.
3—INTERNATIONAL JDP 1600 x 10" draw, 36" x 36" Table.
2—INTERNATIONAL JDP 3000# x 10" Draw 48" x 48" table.
1—J & J #812—30" x 38" Table—10".
1—MILWAUKEE #2542—38" x 42" Table.
2—J & J No. 68S 25" x 30" table, 6" draw.
2—MILWAUKEE No. 1030—30x38 Table.
1—MILWAUKEE No. 1536 32x38 Table.
3—MILWAUKEE No. 3248—44x48 Table.
1—SPO #3058, 22" x 28" table, 8" draw.
2—SPO #3070, Table 26" x 35", 10" draw.

Jolt Squeeze Pin Lift

1—MILWAUKEE #125, 21" x 27" Table.
3—MILWAUKEE #165, 24" x 30" Table.
3—MILWAUKEE #196, 17" x 38" Table.
1—OSBORN #712-V, 18" x 26" Table.
2—OSBORN #710-J, 17" x 21" Table.
9—OSBORN 714PJ, 20" x 31" Tables.
1—OSBORN #818—24x36 Table, 18" cyl.
1—MILWAUKEE #246—24¼x42 Table.
4—INTERNATIONAL PKL, 17" x 26".
2—INTERNATIONAL #PK-16—20" x 30".
1—SPO #2136—21" x 30" Table—13" Cyl.
2—SPO 2114P, Table 21" x 27", 11" cyl.

Shell Molding

1—SHALCO, Model HO4, 2 station.

SANDSLINGERS

1—BEARDSLEY & PIPER Stationary Sandslinger, Model "DB" 5' jib arm, 4' ramming unit. 19" head, 4" cup, 2-speed motor 25 & 16 HP. Serial #676-5403. New 1955.
1—BEARDSLEY & PIPER Model "DB" Stationary Sandslinger 6' ramming unit, 10' jib arm, 19" head, 4" cup, 2-speed motor 40 & 20 HP W/raising & lowering arms. Serial #8-717-5701. New 1958.
1—BEARDSLEY & PIPER 5-ton Roto-Feed Plate Feeder, New 1958.

2—B & P Swing Type Slingers 19" head.
4—B & P 8 ton plate feeders.
6—B & P Tanks for speed slingers.
1—B & P Motive 15' Jib—6' Ram—19".
1—B & P Motive Jr. 8' Jib—4' Ram—19".

CONVEYORS

Steel Apron

9—JEFFREY & LINK-BELT 24", 30", 36" widths. Lengths built to your specifications, with reducers & motors.

Oscillating & Vibrating

1—LINK-BELT 48" x 154', 20 HP Motor.
7—JEFFREY TAYLOR No. 5 Vibrating Feeders 24" wide x 7'.
LINK-BELT "FLEXMOUNT"
1—8" W x 50' L x 4" deep pan.
2—18" W x 18' L x 4" deep pan.
2—SIMPLICITY 24" W x 13' L x 6" Deep.
1—SIMPLICITY 18" W x 11' L x 6" Deep.
1—SIMPLICITY 24" W x 19' x 6".

Roller

2500' MATHEWS 6", 14" wide, 2⅞" dia. roller, ⅞" hex shaft, 4" channel.
1500—MATHEWS 8" wide, 3½" dia. 1" hex shaft on 6" centers, 6" channel.

Mold

1—DUO-ROLL 88 Cars 20" x 48", 350' track, with automatic dumping.
1—PALMER "B" 106 Cars—42" x 62" w/550' Track.

Belt

LINK-BELT & JEFFREY 18", 24" & 30" wide. Flat or trough idlers, all Timken bearings. Built to your specifications. Can be equipped with molders hoppers & Ploughs.

HOPPERS & STORAGE BINS

2—NATIONAL ENGINEERING "Moulders Helper" 2 Hopper Unit.
7—NATIONAL & LINK-BELT Storage Bins, 60 to 150 tons cap.
1—NEWAYGO HS-7-GT, Handy Sandy.
42—MOLDERS Hoppers 1½ ton cap.

SAND PREPARATORS

6—B & P Screeneraters, Models S, M & L.
8—ROYER Models, NC-4, NDS, NDP.
6—AMERICAN Sand Cutters, Model M, Sizes 79/60, 89/70, 99/80. All late.
4—AMERICAN Model AA and AM, 45" & 60" Cutting Blade.
1—AMERICAN "Sand Master," 102"/70" Cutting Blade—1952.
2—MOULDERS' FRIEND 50" x 60" Brush.
2—NEWAYGO RS-V Reddy Sandys.
1—BEARDSLEY & PIPER #60.

SHAKEOUTS & SCREENS

2—LINK-BELT 5' x 10', 6 ton cap.
3—SIMPLICITY 4' x 6' Model B.
1—SIMPLICITY 4' x 8' Model D.
1—SIMPLICITY 4' x 10' Model D.
1—SIMPLICITY 5' x 8' Model D.
1—NATIONAL ENG. 5' x 8' Hex Screen.
1—HEWITT-ROBINS 36" x 78" Vibrex.
1—SIMPLICITY 4' x 10' Model B, Single deck sifter screen, 10 HP motors.
2—ROBBINS 3' x 4' JF6—2000#.
1—ROBBINS 6' x 10' JF11—20.000#.

SAND BLAST EQUIPMENT

2—AMERICAN 36" continuous Tumblasts.
1—AMERICAN 36" x 42", w/skip hoist.
2—AMERICAN 48" x 42", w/skip hoist.
1—AMERICAN 27" x 36", w/skip hoist.
1—AMERICAN 48" x 48", w/skip hoist.
1—AMERICAN 48" x 72" w/loader.
1—AMERICAN No. 2 Tabinst — 6' dia.
1—PANGBORN Model 6-GF, 6' diameter plain table with dust collector.
1—PANGBORN 6 LG-14 Multi-Table, 6-24" tables, w/dust collector.
1—PANGBORN Model 14GK-7 Roto-Blast barrel w/loader.
1—PANGBORN 9LG-14 Multi-Table w/6—36" dia. Aux. Tables w/Dust Collector.

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Circle 686 on Page 45

Advertising Index

Acme Foundry Co. 130
Adams Co., The 138
Ajax Magnethermic Corporation 106
Allied Chemical, Semet-Solvay Division 113
Allis-Chalmers 5
Aluminum Company of America 2
American Optical Co., Safety Products Division 22
American Smelting & Refining Co., Federated Metals Division 19
Atlas Copco 30, 31

Baird-Atomic, Inc. 148
Baroid Chemicals, Inc. 174, 175
Basic Products Corporation, Hevi-Duty Electric Co., Division 41
Beardsley & Piper 117, 118, 119, 120
Bellows-Valvair Divisions of International Basic Economy Corporation 32
Branford Co., The 194

Carman, Edwin S., Inc. 198
Carrier Conveyor Division, Chain Belt Co. ... 12
Carver Foundry Products Co. 17
Cement Gun Co. 162
Centrifugal Casting Machine Co. 202
Chain Belt Co., Carrier Conveyor Division .. 12
Chicago Tramrail Corporation 202
Cities Service Oil Co. 143
Clearfield Machine Co. 47
Cleveland Chaplet & Mfg. Co. 115
Cleveland Flux Co., The 29
Cleveland Tramrail Division of The Cleveland Crane & Engineering Co. 28
Cleveland Vibrator Co., The 210
Crucible Manufacturers Association 111

DeBardeleben Coal Corporation 201
Demmler Manufacturing Co. 123
Desmond-Stephan Mfg. Co. 10
Detroit Electric Furnace Division, Kuhlman Electric Co. 179
Diamond Alkali Co. 196
Dietert, Harry W., Co. 136
Durez Plastics Division, Hooker Chemical Corporation 172, 173

Eastern Clay Products Department of International Minerals & Chemical Corporation 20, 21
Eastman Kodak Co., X-Ray Division 159
Euclid Crane & Hoist Co., The 198

F. E. North America Ltd. 84
Fanner Manufacturing Co., The 167, 168, 169
Federated Metals Division, American Smelting & Refining Co. 19
Foundry Educational Foundation 147
Foundry Equipment Co., The 18
Foundry Services, Inc. 182
Foxboro Co., The 127
Fremont Flask Co., The 40
Furane Plastics, Inc. 200

General Dynamics Corporation, Liquid Carbonic Division 201
General Electric Co., X-Ray Department 13
Globe Steel Abrasive Co., The 161
Goodrich, B. F., Chemical Co., The 44
Great Western Mfg. Co. 198

Hanna Furnace Corporation, The, A Division of National Steel Corporation 192, 193
Harnischfeger Corporation 155, 156
Hartley Controls Corporation 202
Hevi-Duty Electric Co., A Division of Basic Products Corporation 41
Hines Flask Co., The 153
Hoeganaes Sponge Iron Corporation 149
Hooker Chemical Corporation, Durez Plastics Division 172, 173
Hough, Frank G., Co., The 24
Humble Oil & Refining Co., Penola Division .. 93

Illinois Testing Laboratories, Inc. 134
Indiana General Corporation, Stearns Magnetic Products Division 146
International Automation Corporation 105
International Basic Economy Corporation, Bellows-Valvair Divisions 32
International Minerals & Chemical Corporation Eastern Clay Products Department 20, 21
International Molding Machine Co. 25
International Nickel Co., Inc., The 1
Ironton Fire Brick Co., The 181

Jeffrey Manufacturing Co., The 42
Johns-Manville 191
Joy Manufacturing Co. 185

Advertising Index

Kaiser Aluminum & Chemical Sales, Inc., Kaiser Refractories & Chemicals Division .. 129
Kaiser Refractories & Chemicals Division, Kaiser Aluminum & Chemical Sales, Inc. .. 129
Kookuk Electro-Metals Co., A Division of Vanadium Corporation of America 157
Kuhlman Electric Co., Detroit Electric Furnace Division 179

Liquid Carbonic Division of General Dynamics Corporation 201
Loftus Engineering Corporation 11

Machine Products Corporation 198
Manning, Maxwell & Moore, Inc., Shaw-Box Crane & Hoist Division 160
Mathews Conveyor Co. 140
Metal Blast, Inc. 135
Midwest Pressure Castings Co. 16
Minnesota Mining & Manufacturing Co. ... 8, 9
Modern Equipment Co. 212
Moltrup Steel Products Co. 200

National Chemical & Plastics Co., The 202
National Steel Corporation, Hanna Furnace Corporation Division 192, 193
National Engineering Co. 14, 15
Newaygo Engineering Co. 23
Nomad Equipment Corporation 101
Norton Co., Refractories Division 183

Ohio Ferro-Alloys Corporation 171
Oilgear Co., The 87
Oliver Machinery Co. 199
Osborn Manufacturing Co., The 108, 109

Pangborn Corporation 6, 7
Papesch & Kolstad, Inc. 202
Peninsular Grinding Wheel Co. 99
Penn Iron Works, Inc. 196
Penola Division, Humble Oil & Refining Co. .. 93
Permanent Mold Die Co., Inc. 151
Philadelphia Quartz Co. 154
Pickands Mather & Co. 97
Picker X-Ray Corporation 121
Pittsburgh Coke & Chemical Co., Coke & Iron Division 141

Reda Pump Co., Furnace Division 152
Redford Iron & Equipment Co. 48
Reichhold Chemicals, Inc. ..... Back Cover
Royer Foundry & Machine Co. 94
Rudow Manufacturing Co. 199

Security Alloys Co., Foundry Division 180
Shaw-Box Crane & Hoist Division, Manning, Maxwell & Moore, Inc. 160
Simplicity Engineering Co. 131
Smith, G. E., Inc. 177
Smith, Werner G., Inc. 100
Smooth-On Manufacturing Co. 199
Speer Carbon Co., Carbon Products Division 125
Spincraft, Inc. 162
SPO Inc. 164
Spraying Systems Co. 196
Standard Conveyor Co. 178
States Engineering Corporation 201
Stearns Magnetic Products, Division of Indiana General Corporation 146
Stephens-Adamson Mfg. Co., Standard Products Division 201
Sterling National Industries, Inc. 50
Stevens, Frederic B., Inc. .. Inside Back Cover

Tamms Industries Co. 180
Taylor, Charles, Sons Co., The 114
Thiem Products, Inc. 187
Timken Roller Bearing Co., The 188
Tomkins-Johnson Co., The 166
Tousey Varnish Co. 26, 27
Towmotor Corporation 49

Union Carbide Metals Co., Division of Union Carbide Corporation ..... Inside Front Cover
United States Rubber, Mechanical Goods Division 83
Universal Clay Products Co. 194

Vanadium Corporation of America 43
Vanadium Corporation of America, Kookuk Electro-Metals Co. Division 157
Vesuvius Crucible Co. 137

Wheelabrator Corporation 88, 89, 90, 91
Whitehead Brothers Co. 37
Whiting Corporation 145

Classified Advertising 203, 204, 205, 206, 207, 208, 209

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FOUNDRY is edited primarily for management, production, technical and purchasing personnel in foundries. A copy is sent at no cost to each metal casting plant in the U. S. and Canada employing 20 or more workers and to selected smaller foundries. Additional copies are sent to each foundry to the extent necessary to serve key foundry personnel on an individual or routed basis. A limited number of copies is supplied at no cost to educational institutions.
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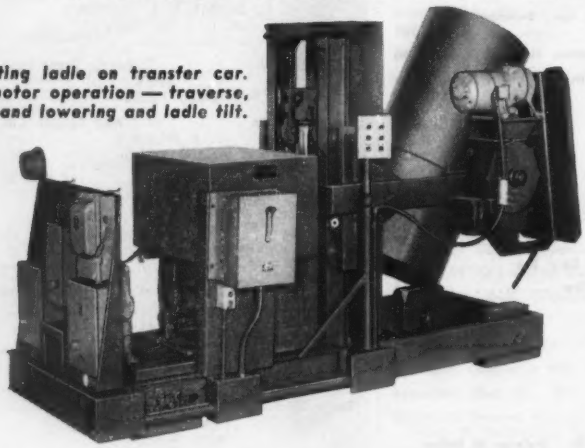
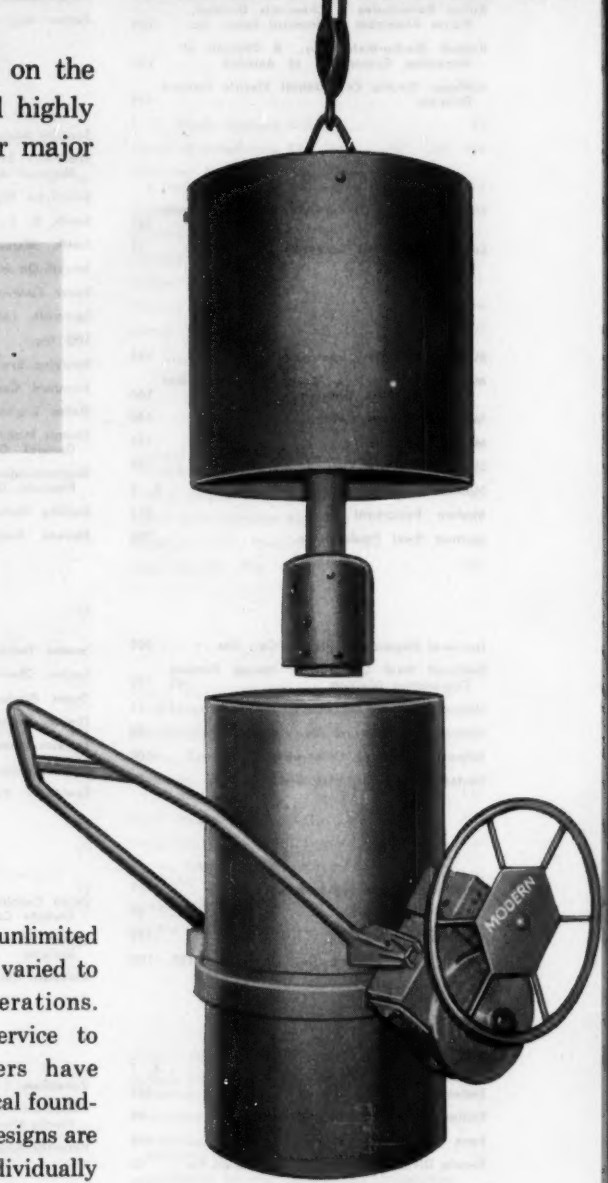


Inoculating ladle on transfer car. Three-motor operation — traverse, raising and lowering and ladle tilt.



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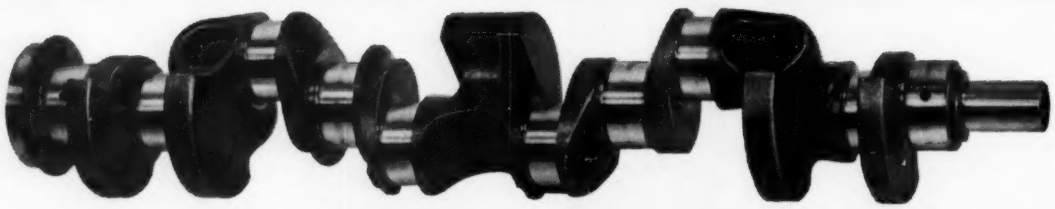

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